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The Orientation of Egyptian Temples.

UNDER the title of "The Dawn of Astronomy," Mr. Norman Lockyer brings before us the results of the investigations which he has been making for some years past on the relation of the temples of ancient Egypt to the position and movements of the heavenly bodies.* From our point of view the book, though nominally concerned with astronomy, is mainly of interest in regard to any light which it may throw on the architectural ideas of that ancient people; on the circumstances under which, and the objects for which, their temples were founded. But this architectural interest of the subject is after all only very limited in extent. The architectural style and the decorative details of Egyptian architecture are entirely outside of the subject; they might have been just as they are had no stars existed, or had the movements of the heavens been matter of absolute indifference to the Egyptians. The one architectural consideration directly connected with Mr. Lockyer's subject is in regard to the reasons for the various and apparently capricious alignment of the temples in reference to one another and to the points of the compass. This point, however, has been made of considerable importance by modern writers on architecture. It involves the question whether architectural symmetry was regarded as a matter of any consequence by the ancients. Fergusson and others have made a point, in an æsthetic sense, of the fact that the Egyptian temples, even when in close juxtaposition, were aligned with an apparently intentional avoidance of symmetry; and upon this fact it has been concluded that the idea of the necessity of symmetry and parallelism in colonnaded buildings is an entirely modern superstition; that the Egyptians and the Greeks were influenced by no such idea; that rather they studiously avoided it; and the argument has actually been made use of as a weapon of architectural criticism, in defence of modern arrangements which seemed otherwise indefensible. If it can be shown that all these apparently accidental or purposeless eccentricities of alignment in Egyptian and Greek temples were after all neither accidental nor purposeless—that they arose purely from the intentional laying out of temples in reference to the rising and setting of the sun or of special stars, the æsthetic aspect of the matter becomes totally changed. The ancient architects could then be no longer considered as indifferent to the alignment of buildings; on the contrary, they regarded this as of the greatest importance; only that the alignment was carried out in respect of the celestial bodies, and not in respect of terrestrial arrangement or symmetry.

Of course we admit that even from the purely architectural point of view this is only a secondary consideration. The grand effect of the hypostyle halls of the Egyptians; the fine artistic design of the open lotus capitals (for the closed or bud-like capitals we care little); these would be of just the same interest to the architect, whether the axis of the temple pointed east, west, north, or south, or to any of the intermediate points of the compass. On the other hand, the idea that these most ancient temples of the world were closely connected with the first systematic efforts of the human race to observe and register, as it were, the movements of the heavens, must give them a great additional interest in the eyes of all thoughtful people, and we should be sorry for any architect who was so taken up with considerations of orders, capitals, and decoration as to be indifferent to the new interest and meaning thus added to ancient buildings. Mr. Lockyer however, is rather too astronomical in his title and treatment of his subject. He seems to regard the Egyptian temples simply as star-pointers. He compares such a temple as Karnac to a telescope: "to keep the light that passes into the eyepiece of a modern telescope pure, we have between the object-glass and the eyepiece a series of what are called diaphragms; that is, a series of rings right along the tube, the inner diameters of the rings being greatest close to the object-glass; these diaphragms must be so made that all he light from the object-glass shall fall upon the eyepiece, without loss or reflection from the tube. The apertures in the pylons and separating walls of Egyptian temples exactly represented the diaphragms in the modern telescope. What then was the real use of these pylons and these diaphragms? It was to keep all stray light out of the carefully-roofed and darkened sanctuary. . . . . If we consider them as horizontal telescopes used for the purpose I have suggested, we at once understand the long axis and the series of gradually narrowing diaphragms, for the longer the beam of light used the greater is the accuracy that can be obtained."

Really we have not seen a more curious illustration of the proverbial "nothing like leather." To the mind of the astronomical writer it appears that all the array of architectural magnificence in the vista of an Egyptian temple—the impressive mass of the entrance pylons, the colonnades of the fore-court, the grand and mysterious effect of light and perspective in the hypostyle hall—is nothing more than the parts of a gigantic telescope fitted to carry a beam of light along its central axis. What then were all these architectural grandeurs for? If Mr. Lockyer had discovered a long series of passages on the same axis, confined between plain parallel walls approaching each other closer and closer as they receded from the entrance, we might agree with him in regarding this as a huge built telescope; but to reduce the whole varied and impressive architectural treatment of an Egyptian temple to nothing more than a scientific instrument; to ignore entirely its disposition for the production of architectural effect; is one of the most curious examples of putting the cart before the horse that we have ever met with in print. In one passage in his book the author laments that every archæologist is not also an astronomer, *i.e.* that he is not capable of appreciating and examining the relation of a temple to star observations, as well as its place in the history and development of architectural art. The criticism is just, if we regard it as proved (and we think it is) that ancient temple-builders did align their buildings, frequently if not always, with relation to the rising or setting of the sun or of various stars. But surely the architect and archæologist may turn round and tell Mr. Lockyer that after all there is some interest in an Egyptian temple, beside and apart

* "The Dawn of Astronomy: A Study of the Temple-Worship and Mythology of the Ancient Egyptians." By J. Norman Lockyer, F.R.S., &c., &c. Cassell & Co.: London, Paris, and Melbourne. 1894.

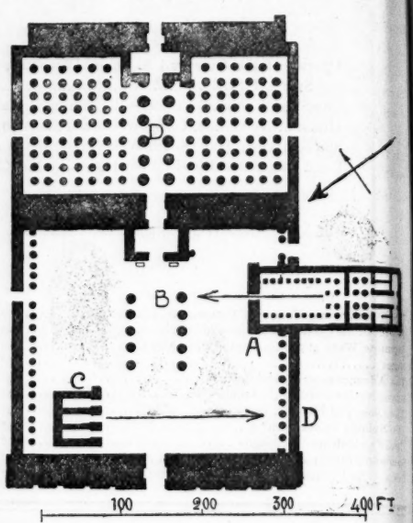
from its astronomical alignment, and that no builders of any age would ever have gone to the enormous expense and thought involved in the planning of such grand architectural effects, if they had not had the desire to produce such effects paramount in their minds.

Not to fall ourselves into the same condemnation of being one-sided in our interest in the subject, let us say that we have followed out the purely astronomical portion of the book with the greatest interest, and fully recognise that it throws a new light on many points in connexion with the study of ancient architecture. We must confess that, for a book written by an eminent man of science, we find it rather deficient in concentration and scientific method; there is a good deal of repetition, and occasionally a want of logical connexion; we seem to be jumped from one point to another in rather a haphazard manner; and the impression left on the mind of the reader is that although the collection of the materials has been a matter of slow and careful study, the actual writing of the book has been rather hurried, and that if another edition is called for it would benefit by a good deal of re-writing, re-arrangement, and concentration. Nor do we quite understand for what public the book is written. If it is written for scientific students, a good deal of the explanation as to the movements of the earth in relation to the sun and stars, and the means of measuring and identifying the apparent position of stars at different epochs, is surely rather superfluous. If this is done for the sake of the general reader, we fear the author is counting on a degree of interest and enlightenment on the part of that noun of multitude which he is hardly likely to meet with. The "lending-library public" seeks mainly to be amused, and is not likely to take the trouble to follow out Mr. Lockyer's reasonings, even though expressed so that he who runs may, if he be so minded, read a good deal out of it. However, we may point out that for unscientific persons who take any interest in astronomy and its methods there is here a good deal of information put in a form comprehensible to the unscientific intellect which will take the trouble to give its mind to the problem.

What strikes us most in this introductory portion of the work is the vivid manner in which the author brings before our imagination the manner in which the problem of the moving heavens must have presented itself to the minds of the early inhabitants of this globe; the awe and wonder which must have attached to it in the first instance, and the interest arising from the slow and bit-by-bit discovery of a law regulating the motions of the stars and sun, of the recurrence of places and periods, and especially of the immense importance and mystery attaching to the daily rising of the sun, the mechanical cause of which was totally unsuspected and beyond the conjecture of the time. Small wonder, indeed, that temples should be dedicated to the sun, that their shrines should be arranged so as to catch in their innermost recesses the first and last rays of that great luminary, the setting of which was like temporary death to the world (especially when the means of artificial lighting were probably so restricted), and its rising like the awakening of all creation once more for another day. It is difficult for us, to whom the main facts of astronomy are almost a part of our school lessons, to put ourselves in the position of those to whom all the causes of the celestial mechanism were hidden in obscurity; and Mr. Lockyer's book brings out this position with remarkable effect. Occasionally, it is true, the author goes off at a tangent into momentary little paradoxes which rather weaken the effect of his presentment, as when he observes that our methods are after all more nearly connected with those of the ancient Egyptians than we are in the habit of supposing. "I assume," he says in one place, "the personification or deification of the sun; I indicate special orientations of buildings devoted to the worship of the sun at one time of the year or another. But really both these things, though they seem improbable, have been carried down to our day, quite independently of any question relating to Egypt. There is nothing new about them at all; there is nothing really strange. When we go into an observatory we think nothing of turning our telescope towards Venus, or Jupiter, or Mars. Here we have the deification of the planets." This is really playing with the reader. What possible analogy is there between an act of worship and a scientific investigation? We do not build our houses to face particular stars for reasons of worship or ceremonial. We are only particular about their sun aspect for sanitary reasons. The orientation of our churches is a ceremonial idea, no doubt; though, as Mr. Lockyer is careful to point out, it is, in this and some other northern countries, an inverted orientation. In the Egyptian sun-temple it was the entrance-end, not the sanctuary-end, which faced the sun; and it is certainly significant that in Italy, the earlier land of the Christian church, the Egyptian and Greek orientation is kept up, and the entrance of the great Roman church still faces the east, not the west. Orientation to the west, to receive the rays of the setting sun, was not, however, unknown in ancient temples, though not the most common.

For the chain of reasoning by which the author shows the probability that certain stars were the objects of orientation; the manner in which their connexion with the names and representations of special Egyptian deities is traced; the calculations whereby it is shown that temples which cannot now be identified with the position of any special star were nevertheless correctly orientated towards them at the time the buildings were set out, we must refer the reader to the book. Many of the instances given seem conclusive, and can leave no reasonable doubt, in the mind of the reader who follows them out, of the reality of the facts. We may also draw attention to the significance of the reason suggested for the direction of the temples specially to the rising and setting of the stars and sun. One reason no doubt would be that to observe the star from the depths of the temple it must be caught when it was low in the sky and nearly on the horizontal line of the temple; but a more important reason, Mr. Lockyer suggests, was that in the early days of astronomy the horizon line afforded the sole possibility of measuring with any degree of accuracy the position of star or sun, the extent to which it had shifted, its apparent position in regard to the earth, and the day on which the sun returned to its annually observed position.

While admitting, as every one who reads the book attentively must we think admit, that the author has proved that the stellar orientation of temples was a frequent practice, and that a great deal of significance was attached to it in certain cases, it strikes us that his subject has carried him a little too far; that he attempts to prove too much, and that his reasons are not always adequate explanations of the peculiarities which they are supposed to explain. We may take as an instance the author's reasoning as to the Karnac group of temples. He reproduces Lepsius's general plan of the site, and after observing that at first glance it seems to negative the idea of star worship, inasmuch as several of the smaller temples have their axial line of sight interrupted by some part of the walls of the great temple, he argues that the great temple was later than these interrupted temples, and that in one or two instances it was the actual intention to interrupt the line of sight of these earlier temples, in order to nullify a worship which it was desired to supersede. We give the plan of the forecourt of the great temple as an illustration of this argument. It is generally recognised that this forecourt was the last portion built, and that the two small temples A and C were in existence before it was built. Here, says the author, the axial line of the temple A is interrupted by two of the columns (B) in the centre of the court, and the axial line from



Fore-court of Great Temple, Karnac.

temple C* is stopped by the boundary wall (D) of the fore-court opposite. Surely this is rather far-fetched. Surely it would be far more likely, and more in accordance with the general processes of religious fanaticism, that a builder who wished to extinguish the worship of temples A and C would have taken the simpler and more drastic method of pulling them down altogether, instead of building his enclosure wall up to the sides of temple A, and leaving temple C as an eyesore to spoil the symmetry of a great architectural feature of his own. To our thinking it only needs a glance at the plan to lead one to the conclusion that those two small temples were retained for some definite reason which appealed to the mind of the builder of the forecourt, and that if he had wished to supersede them he could have done so in a much more effectual manner, without leaving them to interfere with his own architectural *coup d'œil*. Another point in the plan strikes us still more. We should say that if anyone were looking at the general plan of the site with the idea of problems of alignment present to his mind, the very first thing that would strike him would be the well-known peculiar position of the pylons in front of the small Karnac temple. Here we have a row of sphinxes extending from each angle of the front of the temple, parallel with its axis, forming a courtyard closed at the outer end by the great entrance pylons; which pylons, however, are placed at an oblique angle across the lines of sphinxes.† Why were these pylons placed obliquely? That is one of the first points we should have expected to have explained, but Mr. Lockyer does not even notice it, and his "sight-lines" drawn on the map suggest no explanation of it at all. One cannot help seeing, also, that such an arrangement is quite at variance with his "telescope" idea of the temples.

We come to the conclusion, therefore, that there are more points in regard to the alignment of Egyptian temples than the star orientation theory will account for. But it accounts for a good deal, and Mr. Lockyer has added a new and very important chapter to Egyptian archæology, besides producing a book which is of the greatest interest, and will probably open the way for further investigations in the same field.

We may conclude by calling attention to one practical point which is of importance to any one who may be carrying on the same line of investigation in Egypt or elsewhere; viz., that it is of little use, and often misleading, to test any theories of orientation of ancient

* Can this be called a temple? It seems more like the remaining *cella* of a temple from which the approaches had been removed.

† Only the inner portions of these pylons exist, but there is enough to show the alignment. The remainder was very likely formed of earth or unburnt brick.

temples in relation to magnetic north, not only because this varies at different times and in different places, but because the ancients, who (as far as we know) had no compass, knew nothing of magnetic north, and must always have settled their orientation in reference to true north. Mr. Lockyer draws special attention to the difficulties and the loss of time he has experienced in making his investigations, owing to the frequent laying down of magnetic north instead of true north on what were in other respects the most reliable plans available.

REPORT OF THE QUARRY COMMITTEE OF INQUIRY.

THE report of the "Quarry Committee of Inquiry" has just been issued as a Blue-Book. The inquiry was instituted by the Home Secretary for the purpose of ascertaining "the conditions under which the quarrying of stone, limestone, slate and clay is conducted, with the object of diminishing any proved dangers to the life or health of the workpeople engaged therein." It must be premised that the inquiry relates only to open quarries, as underground workings come under the legal definition of mines. The Committee visited quarries in thirteen counties in England, seven counties in Wales, and five in Scotland, but their inquiries were remarkably incomplete. For instance, the total number of men employed in quarrying stone, limestone, and slate in the thirteen English counties visited by the Committee, was, according to the Census Returns for 1891, only 11,930, while, in the two counties of Lancashire and Yorkshire, neither of which was visited, the number was 14,641. Again, the Committee sat to receive evidence on five days only; one of these was occupied in taking the evidence of Dr. Ogle, the late Superintendent of Statistics at the General Register Office, while the remaining four were spent in taking evidence in North Wales, three days at Menai Bridge and one day at Penmaenmawr. During these four days no less than 3,386 questions were asked by the Committee, and the replies of the witnesses—doctors, quarry-owners and managers, and workmen — contain much useful and interesting information, and it is certainly somewhat strange that a similar method of inquiry was not pursued in at least one district in England (say the West Riding of Yorkshire), and in one district in Scotland (say Aberdeen). The report of the Committee really contains comprehensive information respecting the Welsh slate industry only. The total number of stone and slate "quarriers" in Wales is given as 16,227 in the census returns for 1891. We gather from the report that on an average 8,335 persons were employed at the open slate quarries of Carnarvonshire during the ten years, 1883 to 1892, and that there were in this period 128 deaths from accidents, equivalent to an annual death-rate of 1·535 per 1,000 persons employed. This is 0·245 less than "the average death-rate from accidents per 1,000 persons employed at all the mines of the United Kingdom." At the Mountsorrel Quarries, Leicestershire, where about 500 men are employed, the annual death-rate from accidents has been 1·67 per 1,000 men employed. The highest death-rate recorded for any quarry in England is that for the Manchester Ship Canal Company's quarry near Runcorn — namely, 14·56, but this average is calculated on the experience of two years only—3 deaths in two years—and the basis of calculation is therefore much too narrow for the result to be accepted as normal. The highest death-rate recorded for any quarry in Scotland is no less than 16·66, but as this is based on the working of a quarry where only 30 men are employed—5 deaths in 10 years—it also must be considered abnormal.

The evidence given at Penmaenmawr and Menai Bridge seemed to show that the mode of life of the Welsh quarrymen—that is to say, their clothing, their houses, and their food, but especially the last—had more to do with their health and mortality than had their occupation. Dr. R. H. M. Robers declares "I have no hesitation in stating that I consider this occupation to be very healthy—indeed exceptionally so." He added, however, that the men, on account of their manner of life, "are far from doing justice to the healthy character of their work and the healthy position of the quarry." Many of the men lived two or three miles from their place of employment, and were frequently caught in the rain on the way; on reaching the quarry they either set to work in their wet clothes, or, if the rain continued, crowded into the boiler-house to dry themselves. Either of these courses tends to produce lung diseases. Again, the houses are frequently small, ill-ventilated, and terribly overcrowded. The evidence of Wm. Gadlys Williams as to his own house gives a picture of overcrowding and of stifling sleeping accommodation which reminds us of London slums and canal-boats. His house, in which seven persons dwelt, contained two rooms on the ground floor and three on the first floor. These three had been formed by Williams out of one moderate-sized room; the largest of them was three yards square, and the others were each two yards square. In answer to a question as to the height of the rooms, Williams replied:

"They are only 2 ft. high in the lowest part."

"And how much in the highest?" was the next question.

"Perhaps 6 ft."

"You have a bed in each of those three rooms?"

"No, only in two of them."

"How many are there sleeping in those beds, as a rule?"

"Two in each."

Two persons, therefore, slept in a room which contained only 324 cubic feet of air, and two others slept in one containing actually only 144 cubic feet. If we deduct the space occupied by the sleepers, and the bed and other furniture (if any), these figures, lamentably small though they are, will be still further reduced. Probably the actual amount of air in the smaller room would not exceed 60 or 65 cubic feet for each occupant. When we remember that about 3,000 cubic feet of air are required for each person *per hour*, if the room is to be kept "sweet," we can have some faint conception of the state of the air in the small attic after it has been occupied for *seven or eight* hours. The minimum amount of space allowed by law for common lodging-houses is far in excess of that in this Welsh bedroom, namely, 240 cubic feet per head, while for barracks the amount required is 600 cubic feet. No wonder that the Welsh quarrymen suffer largely from lung diseases if such stifling lairs as this are common.

The evidence also showed that the food of the men lacked variety; morning, noon, and night, it was white bread, butter, and tea. The doctors condemned this excessive tea-drinking very strongly and recommended the use of buttermilk, and also of brown bread, porridge, and vegetables. The following food table has been compiled from the evidence of a quarryman:—

1.	Breakfast (before leaving home)		Tea or coffee, bread & butter.
2.	Luncheon.....	11.30 ...	Tea, bread and butter.
3.	Afternoon tea ...	3 to 3.30	Bread and butter, and sometimes tea.
4.	Dinner	6.30 to 7	Potatoes & meat (bacon, mutton or beef).
5.	Supper	about 9.30	Tea or coffee, bread & butter.

The Committee in their report allude to this question of food, and recommend the Welsh quarryman to "copy his brethren in Scotland and elsewhere, and make use of a more varied diet, such as porridge and milk, broth with vegetables, &c., and be careful to avoid stewed tea, for we [the Committee] were struck by the fact that the physique of the Scotch and Cornish quarrymen was decidedly superior to that of the Welshmen."

It seemed to be admitted by the workmen who gave evidence that a considerable number of accidents in the quarries resulted from the carelessness and disobedience of the workmen themselves. The most prolific causes of accidents were blasting, and the falling either of rock from one gallery or level of the quarry into the one below, or of the "overburden" from the top of the quarry.

In order to lessen the dangers from these and other causes, the Committee have drawn up a code of "special rules," divided into six sections as follows:—I. Safety of Quarries. II. Blasting. III. Access to Quarries. IV. Machinery and Plant. V. Duties of Officials and Workmen, and VI. Ambulance. But as these rules cannot, under the existing law, "be enforced at quarries which, owing to the absence of machinery and to the fact that no women, young persons, or children are employed, are neither 'factories' nor 'workshops,'" the Committee consider that further legislation is necessary in order to bring these smaller quarries under the law. It may be added that the quarry-owners as well as the men seemed favourable to the imposition of most of these rules, but the men apparently desired in addition the appointment of a Government Inspector to visit the quarries every month or two.

The evidence revealed the fact that privies or other closets are conspicuous by their absence, and that the accumulation of filth in some parts of the quarries was a source of pollution to the water in the vicinity. The Committee make no rule about this important matter, as rules are already provided in the Factory and Workshop Acts.

In conclusion, reference may be made to the evidence of Dr. Ogle, already mentioned. He found from the statistics of the General Register Office that the mortality of quarrymen in England and Wales between the ages of twenty-five and sixty-five was very high —*i.e.*, 12 per cent. more than of "all males" of the same ages, and this excessive mortality he attributed to the inhalation of stone-dust. He showed that fishermen and quarrymen ran almost exactly an equal risk from accidents, but that the deaths from phthisis and diseases of the respiratory organs were, among the former class, represented by the number 198, while among the quarrymen the figures were 582. Other dusty industries gave figures for these diseases as follows:—Carpenters and joiners, 337; wool-workers, 462; cotton-workers, 543; Sheffield cutlers, 760; file-makers, 783; pottery-makers, 1,118; and Cornish miners, 1,148, the highest figure of all. Dr. Ogle's figures show that quarrymen are an abstemious class, or that their hard physical labour prevents much of the injurious effect which alcohol has on the human system; thus, if the average deaths from alcoholism of "all males" be represented by the number ten, those of quarrymen would be represented by five, while brewers would figure at twenty-five, and inn-keepers at fifty-five.

The evidence of the doctors in Wales seemed to prove that the quarry-dust has no appreciable ill-effects on the workmen, but Dr. Ogle's testimony is strongly in favour of the idea that it has a great effect. And as his figures cover a wider series of facts than did the evidence in Wales, it is probable that they are more reliable. Be that as it may, the Committee acknowledge that Dr. Ogle's "conclusions are somewhat surprising." In order to verify or disprove them, they recommend that further investigations should be made. Certainly the enormous number of deaths from lung diseases, both among quarrymen and other workers in dusty occupations, calls for further inquiry. It will be well repaid if it results in the prevention of even part of this great amount of disease and death.

JAPANESE WORK AT THE BURLINGTON FINE ARTS CLUB.

THE exhibition of Japanese lacquer and metal work at the Burlington Fine Arts Club is a very fine and interesting one, and represents Japanese art in its best light, as the art of decorative applied ornament. The amount of delicate and beautiful workmanship collected in the room is very remarkable, and the collection affords an illustration of the endless diversity of decoration which may be applied to the same class of objects, as in the cases of sword-guards, and in the numerous examples of the small boxes called inrō. We do not know, however, that the artistic interest of the objects exhibited always runs parallel with their commercial or collector's value, as it may be called. There is an artificial taste in these things among collectors, and the pieces which are most valued as examples of lacquer are not always the best designed, and sometimes exhibit beauty of workmanship rather than beauty or fitness of design. Speaking generally, we should place the metal-work portion of the collection a good deal below the lacquer-work in purely artistic value. The want of architectonic perception, characteristic of the Japanese mind, is much more apparent in this class of work, in which constructive design plays a part, than in the decoration of flat surfaces. In spite of remarkable beauty of manipulation and detail, the forms of Japanese metal-work are often not good, they are too wriggly and too unquiet, and deficient in purity of line and in the sense of form. The bronze casting, No. 3 in Case iv. for instance, described as "Stand of Three Tortoises and Waves," may be very valuable to collectors, but it is badly designed; the tortoises which form the feet hang on to the design in a very unconstructive manner. In Case v., No. 46, we have "A Falcon Standing on a Rock"; the bird is splendidly designed and executed, but the rock is a mere mis-shapen lump of metal, with no decorative value whatever; and next to that (No. 45) the flower vase, a big piece of bronze in the shape of a piece of bamboo realistically imitated, is about as bad art as can be, and a thing no one who knew anything of decorative design would look at—if it were not Japanese. There is so much foolish and uncritical admiration of everything Japanese at present, that it is necessary to draw such distinctions, and to remind people that a thing is not necessarily admirable in an artistic sense because it is finely made, or even because it is Japanese. Case xiv. contains some of the most really beautiful work in the exhibition. No. 2, a small perfume box, is covered with beautifully designed flowing conventional foliage in lacquer, and the small box No. 4, with a broad band of arabesques and cherry flowers running round it, is equally admirable. Close to these, to illustrate the weakness as well as the strength of Japanese design, is a perfume box (3) decorated with a lacquer imitation of "the wooden saddle formerly in use in Japan." How is this decorative or suitable to its position? Among the numerous things to be specially admired (most of them among the smaller objects) we may mention the sword-guard formed of two fish, in silver (Case i.); the iron vase in Case iv. (16), of much better and finer form than most of the metal work; the bowl in Case v. (24); the damascened globular vase in Case vi. (4); the small box in the same case (5) with its delicate diaper of silver (observe the effect of the bright little points of metal in the centre of each division of the diaper); the inrō with red lacquer ground, 12 in Case xi., and No. 15 in the same case, with its chrysanthemum decoration; the small box, 28 in Case xii., also Nos. 30, 32, 39, and 40 in the same case; the black lacquer inrō 48 in the same case, in which the design is shown only by relief; the small oval box, 23 in Case xiii.; also, for bad design this time, the incense box, No. 30 in the same case, with a lid decorated with a landscape and an imitation of folded paper mixed up together (!); the box No. 42 in the same case; the shrine, 15 in Case xiv., with its beautiful diaper ornaments; the box, No. 17 in the same case; No. 39 also, a kind of double box in the form (on plan) of two shells partly let into each other, one of those charming fancies in design which we meet only in Japanese work; the incense box, 24 in Case xvi.; the nest of boxes, 28 in Case xvii. (observe the beautiful tone and design of the green lacquer in the lower portion); the box decorated with maple leaves, 34 in Case xviii.; and the splendid tray, 23 in Case xix., formerly belonging to Beckford. The foliage ornament in the angles of this tray is quite a study in itself.

NOTES.

THE proposal of Princess Christian to establish a school of applied design for women is an admirable one. We are glad to see from the prospectus that it is proposed, after the first instruction in drawing, to put students through the study of the various styles of architecture, as a preliminary to the study of design for application to special materials, on the ground that all applied design is more or less connected with architecture. This is a recognition of a point which is often lost sight of, and lady artists are often especially deficient in this knowledge of architectural detail and effect, architecture being generally considered less a woman's subject than a man's. Mrs. Hopkins, of New York, gave her experience as to the results of a similar attempt there, which appears to have been eminently successful in a commercial sense; the school is self-supporting, and three-fourths of the sum raised to found it has been returned to the subscribers. In the great need in the present day of further professional opportunities for women to gain an independent living, nothing could be more suitable than the subject of applied design; and it is one of the few fields of human labour which cannot at present be said to be overstocked.

IT is somewhat ludicrous to find that the first discussion of what is in fact, though not in name, a new Session of Parliament, is the question of contracting out under the Employers' Liability Bill. Though the subject is one of importance, it is little short of a public scandal that the Legislature should not have by this time arrived at a satisfactory solution. The Government have now somewhat given way in favour of the principle of allowing members of mutual insurance companies to contract out. They sanctioned an amendment to allow members of existing societies to contract out for three years after the passing of the Act. But if it is right that this principle should continue for three years, why not for ten? The fact is that commonsense and the general opinion of the country are in favour of a system of contracting out, if, as is the case under the usual schemes, the workman obtains adequate compensation for all injuries. By allowing a period of three years' grace the Government have shown that they do not really believe in their own limitation of freedom of contract, and the vote of Tuesday last showed also that the House of Commons does not like the view of the Government.

WE are glad to see that the German Archæological Institute has issued an official guide to Pompeii. Such a book has been long wanted, and Dr. August Mau was obviously the right person to undertake it. Not only has he a detailed personal knowledge of the excavations that have gone on there, which perhaps no second archæologist possesses in the like fulness, but he has had abundant practice in lecturing and demonstrating *in situ* to parties of German scholars and schoolmasters, and knows how to put his vast stores of information in intelligible form. The book is of compact and convenient form. It has, of course, a plan of the town, and it has, further, twenty-two illustrations, giving, among other matters, many restorations, and here and there a reproduction of some now lost buildings, with other works of art. Dr. Mau gives in his introduction an admirable summary of the history of Pompeii before the eruption, of the various periods of excavation, down to the present day, and a general account of the paintings, mosaics, inscriptions, the periods of architecture, and the materials and methods employed. It is high time that the Rolfe guide-book at present in use among English visitors was superseded, and it could not be better replaced than by an adequate translation of the present volume.

WE have on several previous occasions referred to the proposed establishment of German studios and art workshops at Rome. According to our contemporary, the *Deutsche Bauzeitung*, an opportunity now offers itself of purchasing the grounds of the Villa Strohl-Fern, close to the Porta del Popolo, of which it is expected that the German Government will make use. The site, by reason of its central position, is well adapted to the purpose intended, and has ample room for the erection of studios for painting and architecture, as well as workshops for statuary and handicrafts. Moreover, the spacious and well-laid-out gardens, with a magnificent view of the city, the Campagna, and the mountains, will afford every advantage for the study of landscape, and will also permit of drawing from living models in the open air. The importance of the latter point is much emphasised by Professor Prell, who is associated with Professor Meurer and the other members of the German Artists' Union at Rome in the furtherance of this scheme. It is intended that the use of the studios and workshops shall be free to the holders of Government studentships, whilst other German artists will have to pay fees. It is of interest to note that the institution is to be wholly unacademic, and that its management will be in the hands of an official subordinate to the German Ambassador at Rome.

THE case of Knight Bruce *v.* Judge, which was decided last week, seems to have caused some surprise. It cannot, indeed, be said to have been decided, for the defendant, when it came into Court, did not contest it. The action was brought by a landlord to recover two quarters rent of a house at Sandgate which, owing to the subsidence of the foundation, had become almost uninhabitable. But it is a very old principle of English law that there is no implied agreement by a landlord that a house will remain inhabitable during a tenancy. No doubt a curious and interesting legal discussion might be produced on this point, but it is obviously contrary to common-sense that if by no fault of a tenant a house ceases to be habitable, the owner should continue to receive rent. If the building is destroyed by some commotion of nature the permanent owner should be the person to suffer, not the temporary tenant. The fact is, however, that cases of this kind of hardship are not numerous, and so no attempt has been made to change the law. But as to the law at the present day there can be no manner of doubt.

WE have received samples of a silver white alloy, manufactured under the name of "Silvinite," by the "Silvinite Metal Company." The material seems to be chiefly composed of aluminium. The alloy has great lightness, silvery lustre, malleability, and considerable ductility, and although comparatively soft is tough and strong. In decorative work it might often be used with advantage, either in its natural colour, which is not easily tarnished, or painted with oil colours, which it "takes" well. The manufacturers also claim that it enamels well, but if so, the enamel material applied must be fusible at an exceptionally low temperature, as

the metal itself softens and fuses very readily. For the same reason we can hardly sustain the suggestion that it would be a good roofing material in place of corrugated iron. In the event of fire a Silvinite roof would collapse very quickly, in this way causing probably a more complete wreck than would result if iron were in use. Sulphuretted hydrogen does not tarnish the metal, even after prolonged exposure. Ammonia, on the other hand, distinctly affects the surface of the metal, while caustic alkalies and dilute mineral acids rapidly dissolve it. It is well understood that in gas-lighted buildings much damage is often done to the decorations, metal-work, and pictures by the sulphurous and sulphuric acids which result from the oxidation of the sulphur compounds in the gas, and aluminium or Silvinite would not be exempt from this corroding influence, if we may judge from the results of test-tube experiments. Vegetable acids, such as acetic, do not seem to affect the metal appreciably; but whether prolonged action, aided by alternate wetting and drying by exposure to air, will produce corrosion, time alone can prove. We note, however, that the makers claim that the metal is well adapted for use in the construction of taps, bar-fittings and culinary utensils. The circular sent out with the sample is far too general in its statements and enthusiastic in its tenor. It would have been more satisfactory if exact details as to the strength and capabilities of the alloy, vouched for by well-known experts, had been supplied. There is undoubtedly a large field for this valuable metal to occupy, but that it will really supersede any of the other metals in common use is not likely. The manufacturers claim that "steel and other castings attain a greater degree of fluidity by an admixture of Silvinite." This is a point about which more detailed information would be interesting, for we remember that Mr. John H. Dagger, in his paper read before the British Association of 1889, seemed to think it very doubtful whether aluminium does really increase the fluidity of properly-made steel.

THE lease of No. 20, Bishopsgate-street Without is offered for sale. The premises were built in 1889, at the corner of Devonshire-street, and, it is supposed, occupy part of the site of what was commonly called "Fisher's Folly." The "Folly" had been built by Jasper Fisher, one of the six Clerks in Chancery, whose lavish expenditure upon his house and gardens involved him in ridicule and insolvency. The property passed to Edward, Earl of Oxford, Lord High Chamberlain to Elizabeth. Here he received the Queen as his guest, giving her, so the story goes, the first pair of perfumed gloves brought into England. Having next become a town mansion of the Cavendishes, who, it seems, lived in the parish *temp.* Henry VIII., it was occupied by William, second Earl of Devonshire (who died there, 1628), and his son, the third Earl. But about fifteen years before the latter's death (1684) it had been converted for a while into a conventicle, to whose congregation Butler compares the Rump Parliament.* After the death in 1689 of Elizabeth, Countess of Devonshire, whose son William III. advanced to a dukedom. Robert Murray, founder of the Club of Commerce, opened a credit bank there. In conjunction with William Dockwra he had established at his house — formerly Sir Richard Abdy's — in Lime-street, a penny post, which they began in 1680 with four deliveries, on foot, a day. At the beginning of last century Devonshire-square and, we gather, the Friends' Meeting-house and Institute, were built over part of the garden site, together with Cavendish-court and Devonshire-street. We are credibly informed that the fine old mansion, No. 3 in the square on a parish plan made in 1866, which was pulled down about sixteen years ago and rebuilt as No. 1, was Devonshire House. Sir Francis Baring, Bart., father of the first Lord Ashburton, lived in the square in 1803.

* "That represent no part o' th' nation,
But Fisher's-folly congregation."
"Hudibras," Part iii., canto 3.

IN connexion with the proposal to rebuild Swansea church, it may be of interest to mention that the present church, dedicated to St. Mary the Virgin, replaces one of which the nave and aisles fell down in 1739; but it retains the chancel, with the square south-east tower of the earlier structure. Some of the old monuments, too, were preserved at the same time. They comprise the altar-tomb (in the Herbert, *olim* St. Anne, chapel), with effigies, of Sir Mathew Cradock and his wife, the Lady Katharine, a daughter of George, second Earl of Huntly, and Perkin Warbeck's widow. Another was that of the redoubtable Sir Hugh Jones and Maud, his wife—a black marble one, with brasses, in the chancel. Sir Hugh was made a Knight of the Holy Sepulchre (1442), having fought under John Palæologus II., Emperor of Constantinople, "ageynst the Turkis and Sarsyns in the plies of Troy, Grecie, and Turkie." Returning home he became knight-marshall of England under John, first Duke of Norfolk, slain on Bosworth Field.

IN the Dudley Gallery Art Society's Exhibition the best things are among the smaller sketches and studies. The larger works in this gallery are mostly in a very mannered style. Among the small works those of Mr. George Marks are all good; Miss Nora Davison has some capital sketches of shipping scenes; "Low Tide, Whitby," by Mr. Reginald Jones, is a fine work, taken apparently from a boat in the harbour, the town on the one side in shadow and on the other in light; Miss Bernard's rather slight studies of landscape effects are fine; Mr. David Green's ship subject, "Nearing Home" is good, and also a "Moorland Road" by the same artist, hung beneath it; and Mr. Block's admirable still-life sketches of books. There are a few architectural subjects, of which Mr. Coleridge's "Durham" is the best; Mr. Medlycott's "Venice" is good in colour, but the buildings very badly drawn. Water-colour artists seem to have a spite against St. Paul's; there are three drawings of it here, and they are all bad; in one (8) the dome is shown of the same colour as the masonry, which it never can appear in any light, and in No. 69 the dome is so badly drawn as to be positively painful to the eye. How is it that so few painters seem able to draw a dome in perspective; is it inability, or sheer carelessness? Of Mr. Walter Severn's large drawings we prefer "Beech Trees" and "Sand Dunes, Bamborough"; some of the others are painfully mannered. Another architectural failure is Mr. Williamson's "End of Parliament-street," in which the towers of the Houses of Parliament are simply libelled. Painters should really learn a little about architecture before they make it the main element in a picture.

THE ADVANCEMENT OF ARCHITECTURE.

ROYAL ACADEMY LECTURES BY PROFESSOR AITCHISON, A.R.A.—LECTURE III.

SEEING the leagues before us the engineers have got in iron construction, it seems only natural that the young architects should say to themselves, What have we mainly got to do? and have answered the question in the way that seems most agreeable to themselves.

We have to make things pretty to look at, and to be able to sketch, so as to show our skill and invention. All knowledge, including that proper to the fine arts, is traditional up to the point at which living schools and individuals are improving on the past, or making perceptible alterations from it; and perhaps, with the exception of poetry, all the work in the fine arts is mainly collective; I mean by that, that it all starts from the groundwork of an average of the knowledge and tendencies of the day, each artist endeavouring to add as much personal flavour as he can; but the main conception belongs to the age, except in architecture, where it mainly belongs to past ages. When an architectural student has made himself familiar with the forms of some past style, or styles, it seems delightful to him, if he has invention, and skill in portrayal, to sketch out the view of a church, a palace, or what not—say, Wordsworth's Architectural Vision, Chaucer's House of Fame, or Satan's Palace.

This sketch probably receives the admiration and praise of his fellow students; but if he shows it to some elder practising architect, his friend may praise his invention and his skill in sketching, but he will say, sketching is not of much use to an architect. Then the sketcher and his companions will think, if they do not say, that his elderly friend is a ridiculous old fossil.

What, however, can be more opposed to these aërial visions of beauty than the arrangements for meeting wants, propriety in the use of materials, geometical proportions that are dry matters of calculation, and the mathematical formulæ of statics.

These students are like the young lovers who say "love is enough," and too often do not find among their associates even one who has the shrewdness of the girl in the ballad, who says—

"Will the love that you're so rich in make a fire in the kitchen,
Or the little God of Love turn the spit, spit, spit?'

Lest any of you do not recollect the lines of Wordsworth, I quote them:—

"The appearance, instantaneously disclosed,
Was of a mighty city—boldly, say,
A wilderness of building, sinking far
And self-withdrawn into a wondrous depth,
Far sinking into splendour without end!
Fabric, it seem'd of diamond and of gold,
With alabaster domes and silver spires,
And blazing terrace upon terrace, high
Uplifted; here, serene pavilions bright,
In avenues disposed; there towers begirt
With battlements that on their restless fronts
Bore stars—illumination of all gems!"

Those "alabaster domes and silver spires," and those "towers begirt with battlements," when they become realities, have all to be slowly and laboriously built up, and, to say the least, if not built in accordance with the law of statics will fall down.

Let me revert to sketching. It is a charming accomplishment, and the young architect may make his sketch-book a museum of different architectural motives he has seen in old buildings. The possession of the skill of sketching does often contribute to some graces in design, but it has this drawback: whether it be from real object or from the imagination, the effect only is got, while what the architect wants to know is how the effect is produced, which his sketch does not tell him. In the case of an isolated feature that pleases him it is very well after he has drawn and measured it to take sketches from the eight points of view to see if it perfectly answer, or in what positions it fails.

Let us now look at another phase of the question. In the case of Satan's Palace, when the unhappy architects, who had already made their reputation in Heaven, had to design and superintend the building of Satan's Palace, they had no longer to deal with jasper and beryl, with sapphire, emerald, and diamond, but with metal, and probably knew that it was not necessary to make the golden columns and architraves quite so massive as the former jasper ones, and that metal architraves would carry a good deal more than those of marble, and probably that pendentives were not wanted for the dome; but besides this they would find that new proportions and new methods of adornment were wanted to excite the admiration of even the fallen angels. It is quite true that architects' buildings in the present day hardly ever fall down, as they used to fall in Romanesque, and sometimes in Gothic days, but partial disfigurements often take place, as they did so constantly in Gothic buildings, from arches and vaults not being properly abutted, and though these are not like the awful catastrophes of falling, they cause annoyance, grumbling, and expense.

Sta. Sophia and St. Peter's may be cited as examples of imperfectly-designed work, causing continued outlay and anxiety from their first building, owing to the incomplete knowledge of the architects; even in our time Salzenberg made extensive reparations to Sta. Sophia. Savage, the architect who built St. Luke's, Chelsea, one of the earliest vaulted Gothic churches, had a rough method of getting the shapes and pressures of his arches and vaults, by which he at least made all his vaulted structures stand. He got some clock chains and a board, put pulleys on a horizontal line at the distance apart of the springings of his vaults, and marked the height of the rise on the board, then let the chain down over the pulleys till it touched the mark, weighted

the loose ends, and that gave him roughly the weight wanted at the abutments. If the vault had a lantern he put on a weight equal to the lantern, which gave the curve that would carry it, and of course he had to increase the weights on the ends.

Constantinople is subject to earthquakes, and it was from one of them that the first dome of Sta. Sophia first fell, but on its second falling, owing to subsequent earthquakes, Isodore's nephew rebuilt the present dome 20 ft. higher, so that it is nearly a hemisphere. The domical vault at Florence Cathedral is pointed, and has a small lantern, but at St. Peter's, St. Paul's, and St. Genevieve at Paris, the external domes were wanted to look like hemispheres.

Michelangelo had never noticed that a rope tied at both ends, to nails on a line, fell lower and its sides straightened, when a weight was hung on the middle of it, and consequently the dome of St. Peter's has only been kept up by putting iron bands round it and the drum.

Wren built his lantern on the walls of a lime-kiln, and made his outer dome of wood, the reason probably being that stone could not be afforded; but Rondelet managed to carry his small cupola at the top of the outside dome on the middle Catenary dome, which took the place of Wren's limekiln, and made his outside dome of stone; the present lantern is, I believe, of wood.

This, however, by no means exhausts the most commonplace arguments in favour of a knowledge of statics.

One of the great causes of our admiration of Gothic structures is their novel daring in construction, and this was gained by a practical acquaintance with the strength of stone, and the thrusts of vaults, and a desire to surpass former achievements; if we want to rival them, we must have at least the preliminary knowledge. The exact strength of most materials has been ascertained, and the engineers have applied, to utilitarian purposes, this knowledge of iron in the most marvellous way, and when the architects have acquired the knowledge, they will also have to apply it for emotional purposes as well. No Gothic cathedral, I believe, has a vault of so large a span as those of some of the Roman baths and basilicas; but Rome had the tribute of the civilised world for its expenditure, and armies of slaves to execute the work; while the Mediævals were always short of funds, and were hampered by a thousand obstacles that were quite unknown to the Romans. And while the Roman vaults were solid masses from 5 to 6 ft. thick, the Gothic vaults were only a few inches; and even the main ribs were rarely half the thickness of the Roman vault. I merely instance this as an encouragement to you, to show you what the knowledge, skill, perseverance, and daring of architects can do with everything against them, for the Mediæval architects built in sparsely-populated and poverty-stricken countries, and when we compare them with the Romans, they had to contend against the achievements of the largest, the wealthiest, the most populous, and the most cultivated kingdom of the world. If in some respects they were surpassed by the Romans, in some respects they surpassed everything that had been done before.

It is mere pedantry, if not incompetence, that makes us use old forms of construction that we should never think of using in a building for purely utilitarian purposes. Our business is to learn how to make our commonplace construction also answer for the effects we want to produce: this end is to be achieved by study and by effort. You may go to an engineer, and get him to make your hidden ironwork strong enough for its purpose, but directly you have to make your ironwork sightly or beautiful, and are ignorant of the laws of construction, and of the qualities of the material, you must either be guilty of immense waste or give it up. You cannot be constantly running to your engineer to see if you may pierce this, or thicken that, even if he can tell you; these points are mostly beyond his experience, and could not even be calculated, except at an enormous expenditure of time. Even now, you occasionally want shapely iron columns and stanchions, bressumers, and girders, strings of stairs, cantilevers, and what not, besides the whole class of grids, railings, and balustrades.

It is not that some architects cannot design these things, for you occasionally see a charming bit here and there that some benevolent architect has presented to the public. The plain reason of there being so little good ornamental ironwork to be seen is this: That the public will not pay the architect for designing it, for it takes three or four times as long to do as that in stone or wood, and therefore the public naturally does not get it. You cannot often get a hansom cabman to drive you for two miles by offering him a halfpenny.

Fifty years ago an architect named William Vose Pickett, was so much struck with the possibilities of cast-iron, and, with the misfortune of architecture as an organised and progressive art, having stuck in the mud since Gothic times, that he actually laid out his money on a patent for his scheme of using iron. Something very like his proposed glazed porticoes may be seen at hotel doors and railway stations, only his were suspended; but his rain-guards to windows, which, by-the-bye, he called "sun-guards," consisting of a quarter of a sphere of iron and glass, have not yet come into use, except as old-fashioned window conservatories. Some of his ornamental inventions have not commended themselves to public taste; for instance, his bolts to connect the iron-work were to project, and to have a sort of pierced ornamental washer on them, some distance from the walls, whose shadows were to charm the beholder; but I am afraid they never did.

He must have written his fingers off to advocate the use of iron. I hope he is, or was, successful; but I never heard of any of his work, and one knows the usual fate of those who are sanguine over novelties. I give you a few extracts from his second book of 1845:—

"It has in various parts of this essay been explained that all the architectures practised throughout the successive ages of the world, are based upon the properties of the *same material* (*i.e.*, stone), and are therefore incapable of producing any *entirely and integrally dissimilar effects one from the other*.

Numerous and important modifications in these effects amounting to *distinct styles* in architecture, have at several periods of history been produced. But it has long been held as a reproach to this country that (notwithstanding she may, perhaps, claim the merit of producing a variety in the Gothic style) she possesses no architecture—no style of architecture—that can be called *her own*. Babylon, Hindostan, Egypt, Greece, Rome, the Moors, the Mohammedans, and, if it be worthy of being so termed, the Chinese, have each an architecture bearing the name of the respective nations or people that produced it. But Great Britain, a nation which, in the vastness of its territories and power may justly claim to rank amongst the greatest of these, has no architecture of her own, and has therefore been condemned to adopt and imitate the practices of nations long extinct; but in which somewhat humiliating task she has hitherto been kept in countenance by the united practices of all Europe. Yes, England, in common with all Europe, in the nineteenth century (notwithstanding the immense difference in her state and circumstances) has no architecture but such as other and remote ages have left to her. The hidden treasures of the earth have been revealed to her in the greatest abundance; science has succeeded in bending the elements to her will, and in producing results almost surpassing poetic fancy to conceive; the mechanical arts have been essayed to an almost incredible extent, and still continue to advance with giant strides to the accomplishment of innumerable things unknown to our forefathers; and yet in architecture, the most valuable, the most important of the arts, no endeavour appears to have been made to conform to the spirit of the age, to adapt the numerous elements with which practical science has presented us, for the real advancement of art — the same materials, the same forms, the same methods of construction are employed. We are still where Greece, and Rome, and Middle-aged Europe left us, with the exception, that in attempting to avoid the mere mechanical imitation of their productions, we are most lamentably, continuing to depart, from the excellence to which they attained. . . ." He then quotes from a Mr. Kohl who says:—"Is it then quite impossible to escape from the Greek columns—the Byzantine cupolas—and the Gothic towers and arches? And are architects to be condemned for ever to ape this 'classical antiquity'? Are no different forms and shapes to spring out of the ground and brain of man? If we cannot conceive any such new form, that is no sign that such a conception can never start into life. The Greeks, in their time, could have had no idea of *a Gothic tower*, and the beauty of *a Gothic cathedral*. It is, indeed, singular, that we find none of our architects gifted, with sufficient imagination—that we could give him a commission to execute a building, in an *entirely new*, but no less beautiful and classical a style" (Mr. Kohl's "Travels in Germany, Russia, &c.").

Mr. Pickett then says:—"Our author is somewhat premature in this remark. Had he been aware of the discovery which, at the time of his writing, was already in existence, he would have paused before he included the whole of the nineteenth century in his otherwise just predictions of the opinions of posterity."

The late Ambrose Poynter, the architect whose beautiful sketches adorn the early volumes of the R.I.B.A.'s "Transactions," and who was the father of the present R.A., and only died a few years ago, obtained the silver medal of the R.I.B.A. in 1842 for an essay "On the effects which should result to architectural taste with regard to arrangement and design from the general introduction of iron in the construction of buildings." I thought it might be interesting to you to hear some of his views on the subject of iron and of architecture generally, so give you the following extracts:—

"Whether we contemplate the architecture of the Egyptians or the Greeks, the stupendous piles of the Eternal City, the gorgeous monuments of the Gothic style, the mazy intricacy of the Alhambra, or the finished productions of modern Italy, the mind perceives in each and all the adaptation of the means to the end, and the development of the spirit of the age and country, in which, and for which, they were created, and these form the essential principle of the relative beauty of architecture. Now where shall we turn to find the beauty born from the spirit of our age and country, in the architecture of the nineteenth century? The very proposition at the head of this paper is an answer. In the nineteenth century we are in possession of a material in extensive operation, offering us new modes of construction, new proportions, the power of creating new forms and combinations, differing from everything that has preceded them in art.

It is now sixty-two years since the erection of the bridge at Colebrookdale first revealed the capabilities of cast-iron in construction on a large scale; and during that period, science and cast-iron have marched hand-in-hand, with strides it is amazing to contemplate But what has *art* effected with this new power? The Institute of British Architects are still at the enquiry 'what effect should result to architectural taste from its general introduction?'

In the real adaptation of cast-iron to architecture as an art, we are much where the Dorians were when they had placed four trunks of trees in a row with a tile upon each. There the Doric order might have remained had the Dorians been of our stamp, and there it would have remained had trunks of trees instead of cast-iron been first used in construction in our time. Or perhaps the parallel will run closer if we compare ourselves with the ancients, when they first adopted the principle of the arch, since they combined it with architectural forms already established; as we shall probably seek to do with cast-iron whenever we begin to bestow our attention upon it. After sixty-two years' experience under circumstances through which a new and original style of architecture might have been developed, we are still where the Romans may have been when they built their Cloaca Maxima.

To what are we to attribute this stagnation in all our ideas as regards art in this point of view? Doubtless to the blind spirit of imitation and obstinate adherence to precedent (whether applicable or not seems of little importance) which characterises the architecture of the present day. Where cast-iron is to be used, the first requisite seems to be to keep it out of sight, or to make it look as much as possible like something else. To impress upon it the character of a style would be more in the spirit of the ancients, whom we profess to adore.

Not that it is in the power of any man to stand forth and say, 'I will invent a style.' A style, like a language, must be the growth of time and circumstances; and who is to make the first essay in an age when precedent is 'the be-all and the end-all,' and when he who cannot command success cares not for the higher distinction of deserving it?

The fatal effect of this spirit on our architecture might be evidenced in various ways. What has been advanced on the subject of cast-iron is very far from being the strongest point in which it might be shown, but the argument must be limited to the question under immediate consideration. It may, perhaps, be further illustrated by a *reductio ad absurdum*. Let us suppose that the Greeks had possessed no marble, but had known the art of casting large weights of iron, and had thought proper to use it 'with regard to arrangement and design,' as it *might* have been used in their hands: we will further suppose that the art had been lost; we should, perhaps, still have looked upon the monuments of antiquity so

designed and constructed, in the same vulgar spirit with which it has been the fashion to con template the Parthenon—as something to be imitated. How would our 'genius have been cramped'! (as the phrase is). How should we have lamented at finding ourselves restricted to the use of stone or marble, in which we should have sought in vain to reproduce the light forms of antiquity!

Instead of striking out original proportions and combinations adapted to our means, we should sit down perfectly convinced that neither beauty nor character could be created under the disadvantage of such materials, and abandon ourselves in despair to the construction of bare walls, the monotony of which might now and then be relieved by the crash of a public building, through the laudable attempt of some *classical* genius to support it on Bath stone columns five and thirty diameters high."

I once had to examine some architectural students in structural ironwork; most of them displayed complete ignorance on the subject, while a few, who hoped to gain their living by imitation Gothic, were indignant at being asked about so new-fangled a material as iron. They said they studied nothing since the thirteenth century, though they probably lived in houses where iron stanchions and iron joists were used. The modern student has an instinct that no living is to be made out of ornamental cast-ironwork, so he utterly refuses to make any attempt in that direction. This is a pity, for though architects may never gain a living by designing ornamental ironwork, it is a fine opportunity for the exercise of invention, as it is untrammelled by precedent, and if the capacities of the material are not infringed, there is nothing to prevent beauty being bestowed on it, except want of ability in the designer. I wish also to draw architects' attention to this fact, that nearly all the Exhibition buildings, from that of 1851 to that of last year at Chicago, have been of iron, and that most of the buildings for large shows have been, and are, mainly of iron. Here is a considerable field for the exercise of his profession taken from the architect, and handed over to the engineer; all iron and most stone and brick bridges have been so transferred for the simple reason that architects decline to study construction, so that in the eyes of the public, the architect and engineer carry on the same profession, but the engineer is a man of larger mind. If all construction that cannot be solved by "the rule of thumb" be persistently neglected, I very much fear that the architect will sink into a tame architect kept by the engineer to put his crude forms into shape. As it is, when an engineer wants assistance of this sort, he asks to be recommended to a young man who is clever with his fingers.

In regard to iron construction, it should not be forgotten that M. Zola said the most swaggering buildings of the nineteenth century were the iron central markets of Paris, and compared them favourably with St. Eustache.

Hitherto the general forms of supports, such as piers or columns, have been given them from the ease of building them, *i.e.*, square or oblong in the case of brickwork, or from their security, for when built in brickwork the square or oblong bonds well, but the circle does not, except the bricks are made for it, while in stone a circle is safe if dowelled; or from the convenience of their shape in the position they stand in, or instance, in the case of columns; and be it noted that the Greeks in their best days never used square plinths to their columns, over which people trip. Occasionally columns have taken their form from caprice as the knotted Romanesque columns, and the corkscrew columns of Gothic days and of the late Renaissance; of the latter, those of Bernini's to the Baldachino of St. Peter's are typical.

In cast-iron it is found that hollow cylinders are more than twice as strong as stanchions, whose section is a cross. The proper depth of stone and marble archivolts was gained by experience, and the feature of stepped arches in Romanesque and Gothic, which was originally an economic expedient to save centering, was seized on by the Romanesque and Gothic architects as parts to be ornamented, and has become one of the marked æsthetic features in Gothic.

The groined vault was another economical expedient to save the expense of carrying the walls supporting the main vault to the crown of the cross vaults, and if M. Corroyer's theory be true, the Gothic groin was an expedient to cheapen domes. The same is true of parts in cross strain, such as stone architraves, lintels, or girders, &c. It was cheaper to keep them solid than to hollow them out in the middle, even if they could be hollowed out safely, but when the use of cast iron became prevalent, it was found that its power to resist compression was more than six times as great as to resist tension. It was therefore necessary in cross strain to make the bulk of metal in the lower flange six times as great as that in the upper flange. Riga fir crushes with about two and one-third tons on the square inch, and is broken in tension by about one and three quarters tons, but it is only in the case of trusses that it is worth while to consider its respective powers.

The necessity or adopting the cheapest form was made more important when such a costly material as iron was used. We do not yet know whether piers and columns, arches, vaults, and domes may not take new shapes according to the strains they have to bear. We read of some American architects when they have arranged their building for its necessities, getting out their sheets of strains to see the forms and positions of the piers and the shape of the arches.

There is one point that is generally overlooked in speaking of the necessity of studying statics: Vitruvius says (Lib. iii., Cap. 1) "Symmetry arises from proportion, which the Greeks call *αναλογια*. Proportion is a due adjustment of the size of the different parts to each other, and to the whole; on this proper adjustment symmetry depends. Hence no building can be said to be well-designed which wants symmetry and proportion." Hitherto this proportioning of the parts to the whole has had to be got by arbitrary methods, that is to say we have to study the proportions of the grand antique buildings, which have charmed, us to get it, and certain rules have been given us by Vitruvius; but, as our buildings are for such varied uses, and in some respects so different from the antique examples, the precedent of time-honoured proportions has failed us, particularly in those parts which perform some important structural function. Now statics will give us this necessary symmetry, using the word in the Vitruvian sense, and not in the modern one, as far as the structural parts are concerned; and nothing else will do it properly; for, if the buildings to be erected are of a different size from those that have furnished us with the proportions, the parts of a smaller new building will be as much too massive, as those of a larger one will be dangerously slight. Even if we are most concerned about the appearance of our building, we could not make its parts slighter than safety admits, however light we wish our building to look; and if we wish our building to be more massive than necessary, nothing could give us the relative sizes better than to add a uniform percentage to each part.

One of the commonest faults we meet with in modern buildings is a gross disproportion between what is to be carried and the carrying part. To speak of one feature only: we constantly see balconies with cantilevers big enough to carry the house. Balconies about 3 ft. wide, whose floors are apparently composed of 3-in. York landings, may be seen in halls, supported by enormous double curved cantilevers, resembling those that carry the sides of houses in Florence; while the landings would have carried themselves, if properly tailed into the wall. All such monstrosities would disappear if the parts were properly proportioned to the weight they have to carry.

It seems ridiculous to have to insist on the importance of statics when civil architecture is a constructive art, whose productions, buildings, are wanted to stand securely, without extraneous help. The science of statics is defined as "the effects of forces on solid bodies at rest," and a building is always wanted to be at rest. The main forces that are brought to bear on a building are the gravity of the materials used in its construction; and these materials, when in the form of inclined beams, as in roofs, or of the wedge-shaped pieces in arches, vaults, and domes, tend to overset the parts they abut against. There are also the extraneous loads put into them, which sometimes have a thrust of their own as well. The pressure of the wind, and the vibration caused by it, and the weight of snow, are external forces that act in the same way; and occasionally, though rarely, the mechanical forces of water, ice, and fire.

One must never forget that among the many causes that produce the requisite effects in architectural buildings, those caused by statical considerations are important factors, and in a few cases by far the most important. One can hardly deny that raking shores to a wooden building, when the roof is not tied, form an important feature; and so does the system of stone shoring, which is composed of buttresses and flying buttresses. The devices resorted to for the abutment of domed structures also give a marked character to such edifices.

Although construction is the master art in architecture, it brings to the architect neither fame nor reputation, not even recognition. The old saw that tells us "to speak well of the bridge that carries us" is universally overlooked.

If there be a successful building, who ever asks who designed it, and who ever mentions the architect?

An ingenious American lady published a book to express her belief that all the most convenient, elegant, and beautiful houses were designed by their owners or occupiers, so very simple does our tremendous art seem to the ignorant; for, as the editor of the *Builder* wittily remarked, "Is not architecture the last stronghold of spontaneous generation?" Yet if the smallest defect be found in the construction of a building, to speak at present of nothing else, the owner will then be awake to the fact that the building was not self-created, and woe betide the architect who has committed so unpardonable a sin. So I must strenuously urge you to learn as much of the science of construction as you can.

I know it is the fashion in writing on the subject to treat it lightly, and say after you have mastered construction, do so and so, but few persons, even of those specially gifted, can completely master it, even if they devote to it their whole lives, and every architectural student is not a Wren. Every architect should, however, know how to calculate the strength of a column, a girder, and a truss, the conditions of stability of a steeple and a wall against the wind, if not of the latter against earth and water, the thrusts of an arch, a vault, and a dome, and the pressure of water in large cisterns, or he may have a most serious disaster. Nor need you be ashamed of some tincture of science, for in the Arabian Nights the architects are always called geometers or mathematicians.

It is because architecture requires such vast and conflicting attainments that it is one of the master arts, and that great architects are much rarer than the black swan. Nothing can be more patriotic than to be the architect of a really great building, even though its dimensions be but small. A whale is not a more perfect or interesting animal than a nightingale or a humming-bird; how much does the monument of Lysikrates heighten our notion of the supremacy of the Greek mind; how much would our admiration of Rome and the Romans be lessened if the Pantheon had not been built; and yet the architects of both these buildings are unknown, or, at the most, known to a few erudite scholars and antiquarians.

The greatness of all nations is built up of the patriotism of the unnumbered and the unnamed. Think of what that skeleton of the sentinel at Pompeii tells of the virtue and patriotism of Rome's meanest citizen. The mere thought of that solitary man braving one of the most terrible catastrophes recorded, and willingly meeting that terrible death at the call of duty, brings tears of tenderness and admiration into our eyes.

Michelangelo says, "Sculpture, painting, architecture, are but subordinate branches of draughtsmanship," but with all deference to this great sculptor, I must, as regards architecture, venture to differ from him, as, in my opinion, it is a transcendental form of construction.

Michelangelo is to be excused for this opinion, for in his day, all that was thought worthy of attention was style and the appearance of buildings—organic advancement could hardly be desired by painters, sculptors, goldsmiths, and antiquaries, who scarcely understood what it meant—though he found to his cost at St. Peter's that something more than draughtsmanship was wanted to make a dome safe. We have Wilars de Honecort's sketches, which I fear would not have given Michelangelo much pleasure, nor have given him a high opinion of de Honecort's skill, yet he is believed to have built a cathedral in Hungary, if not in France, and to have made important alterations to churches. It was in the full tide of the thirteenth century when each church was wanted to be in the fashion. We may be sure if Michelangelo could have built a Gothic cathedral, he would have used at least four times as much material in it as Wilars de Honecort. For permanence, the most skilful of the Gothic architects erred on the side of slightness, particularly in their outside work, as the late flying buttresses have been so worn away by the weather that the whole structure they support would probably have fallen, if not shored while these were renewed. Much of the pierced work of screens and gables, put up for pure ornament, have partly or wholly perished. We may

applaud these Gothic architects' skill, though we must deplore their want of judgment; but it is as likely as not that, like our engineers, they were beset with the difficulty of cost, and thought that "sufficient for the day was the evil thereof." If many of our wrought-iron bridges were not constantly painted and kept in repair, they probably would ere this have fallen down.

There is a large chapel at the back of one of the churches in Paris, the ceiling of which seems to consist of flat slabs of stone, apparently supported by pierced stone cantilevers. The appearance of the ceiling is not beautiful, and it produces the worst possible effect in the building, that is, it makes the chapel look unsafe; but in spite of these considerations, one cannot help admiring the architect's profound knowledge of the material he used.

I daresay Paganini produced finer music with all the strings to his fiddle, than when he had cut all but one, but his getting music out of that one, showed his unique knowledge and skill. We should all desire to have such an intimate knowledge of the materials we use, and the skill and daring to use them, displayed by this architect.

We hope, however, we should have self-denial enough to resist the temptation; for, after all, it was but a means of getting the applause of the vulgar. If the vanity and folly of such a proceeding be pardonable, I think we may say that a great artist would have preferred the applause of one judicious critic, to captivating by a mechanical trick all the ignorant in the world.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

THE eighth general meeting of this Institute was held on Monday evening last at No. 9, Conduit-street, Regent-street, Mr. J. Macvicar Anderson, President, in the chair.

The Secretary, Mr. W. H. White, announced that the following gentlemen had been recommended for admission—ten as Fellows, and twenty-eight as Associates:—

As Fellows—John Perrins Osborne, Birmingham; Thomas Batterbury, Bedford-row, W.C.; George Hubbard, Finsbury Circus, E.C.; Jethro Anstice Cossins, Birmingham; Frank Barry Peacock, Birmingham; Walter Talbot Brown, Wellingborough; James William Fisher, Wellingborough; David Jenkins, Llandilo, Carmarthenshire; Howard Chatfeild Clarke, 63, Bishopsgate-street Within, E.C.; Joseph Morris, Reading. *As Associates*—Charles Kempson, Leicester; Harry Barnes, Sunderland; John Ernest Mowlem, Swanage; Henry Dearden, Batley; Edward Box Wetenhall, Finsbury Park, N.; Ernest Robert Barrow, 76, Mount-street, W.; William Henry Ashford, Penralley; Arthur William Sheppard, Architect's Office, School Board for London; Harold Clapham Lander, 6, John-street, Bedford-row, W.C.; David Forbes Smith, Salisbury; William Tillott Barlow, 23, Finsbury Circus, E.C.; Francis Peter Halsall, Southport, George Ernest Nield, Monument Station Buildings, King William-street, E.C.; John Robert Earnshaw, Manchester; Franklin Kaye Kendal, 1, The Paragon, Blackheath, S.E.; Roger Francis Bacon, Reading; Harry Evan Jones, 9, Moorgate-street, E.C.; John Rennison Little, Bolton; Arthur James Forge, Woodford, Essex; Frank Lishman, 51, Grandison-road, Clapham Common, S.W.; Arthur Hill Morgan, Hoole; Douglas George Salier (Tasmania), 11, Spring Gardens, S.W.; John Lloyd Houston, 13, Furnival's-Inn, E.C.; George Harry Mael Trew, Royal Engineer's Office, Woking; John Humphreys Jones, B.A.(Lond.), 9, Moorgate-street, E.C.; John Newnham, 61, Palace Gardens-terrace, Kensington, W.; William John Childs, 7, Cedars Villas, Putney Bridge-road, S.W.; Alfred Kirk Brown, Hull.

The President expressed regret that one of the gentlemen who was appointed an auditor at the last annual meeting had sent in his resignation, being unable to fulfil the duties. He therefore begged to give notice that at the next meeting it would be necessary to appoint an auditor to take Mr. Middleton's place.

London Streets and Buildings Bill.

The President said that all the members were aware that a Bill was being promoted by the London County Council called, "A Bill to Consolidate and Amend the Enactments Relating to Streets and Buildings in London." This Bill contained certain points which they could not as architects approve, and he therefore desired to ask the members, on behalf of the Council, for authority to lodge a petition to the House of Commons against the principles and details of the Bill. This did not involve an inimical position in any sense to the London County Council; on the contrary, they were now doing what they could to assist the County Council in carrying a really good and beneficial measure. They had suggested that possibly by conference many difficulties which now presented themselves might be removed, and the County Council had accepted the suggestion. The Council, therefore, appointed delegates to meet them in the course of this week, and he trusted the conference would result very beneficially in removing many of those points to which they took exception. There were, however, certain principles in the Bill, to which it was not necessary now to refer, that they could not possibly accept, and it was necessary, if they were to take action at all, to lodge a petition by a certain date. He begged therefore to move:—"That the Council of the Institute be instructed to take the necessary steps to lodge a petition to the House of Commons against 'A Bill to Consolidate and Amend the Enactments relating to Streets and Buildings in London'—the suggested short title of which is 'The London Building Act, 1894'—in order to secure for the Institute a *locus standi* to be heard on the principles and details of the proposed measure before any Select Committee that may be appointed for the purpose."

Mr. Tavenor Perry said he wished to move that a special general meeting should be held to consider the instructions to be given to the delegates before they met the County Council on this very important subject. It was a subject which not only concerned them as architects, and that very seriously, but all their clients, which was much more to their interest; and there were many details in the Bill—limitations of areas and of height and a number of details of that sort—which ought to be discusssed by them as practical architects before they instructed any two or three delegates to act on their behalf. If it was necessary to move an amendment, he would propose that a special general meeting or some sort of meeting of the Institute be held at which they could instruct their delegates before meeting the County Council.

Professor Kerr said Mr. Perry's was a separate motion, which the members would probably all agree to in order to give the Institute an opportunity of discussing the matter, just as the Surveyors' Institution were doing.

The President remarked that there was no objection whatever to the Institute discussing the matter; the more it was discussed the better, but it was necessary, in order to give them a *locus standi*, to lodge a petition before a certain date.

Mr. Tavenor Perry said he desired that they, as a body of architects, should have the opportunity of instructing their representatives as to what they were to do.

Mr. William Woodward said he heartily concurred in the proposition made by Mr. Perry. The delegates should have distinct ideas as to the various matters of detail which they would have to consider before the County Council.

Professor Kerr then seconded the motion.

Mr. Payne said the members were asked to assent to a proposition of which they knew nothing. The President had said that there were certain principles in the Bill to which it was not necessary now to refer that they could not possibly accept, and yet the members were asked to give the Council authority to oppose those principles of the Bill which had not been explained.

The original motion was then put and carried with one dissentient.

Mr, Tavenor Perry moved his proposition, which was seconded by Mr. Woodward.

Mr. Octavius Hansard suggested that the word "delegates" should be left out of the motion, because in all probability the delegates would have met the County Council before the meeting was held. He thought they should take the thing broadly and discuss it at a full meeting of the Institute.

Professor Kerr remarked that the Building Committee had stated publicly that the County Council were anxious to obtain the opinions of all and sundry.

Mr. Perry's proposition was then agreed to.

The Royal Gold Medal.

The President announced that, at a fully-attended meeting, the Council had resolved to propose, as a fit recipient of the Royal Gold Medal for 1894 the name of one who was a typical representative of the fine arts in this country—a distinguished painter, an eminent sculptor, a fluent linguist, and a finished orator, but who, in addition—which was, perhaps, of more importance to them—by his literary productions, and more particularly his recent Royal Academy addresses, evinced an intellectual grasp and a familiar knowledge of their art, which had influenced materially, and could not fail to continue to influence materially, the promotion of architecture. He had, therefore, on behalf of the Council, the greatest possible pleasure in proposing that the name of the President of the Royal Academy of Arts, Sir Frederick Leighton, be submitted to Her Majesty as the Royal Gold Medallist for this year.

Mosaics and Fresco.

Papers on the above subject by Messrs. C. Harrison Townsend, James C. Powell, G. Salviati, and N. H. J. Westlake were then read.

Mr. Townsend observed that English artists and craftsmen were before those of other countries in recognising the conditions of their materials. In stained glass they welcomed the lead lines; in wall-papers they tried for no fraudulent effect of hung tapestry. Architects were anxious to relieve the grey gloom of this climate by the introduction of colour on the façades and the wall-surfaces of buildings; and they welcomed such craftsmen eager to work out, and apply with conscience, proper principles in such arts as helped them to attain that end.

After defining mosaic, mentioning one or two different methods of setting it, and urging that, as regards the cement, it should be the artist's endeavour not to treat it as a surface *on* which the *tesseræ* were applied, but as a material *in* which they were placed, he suggessted the axioms indicated by a study of what our predecessors had left us to profit by or avoid.

1. The joint was an integral element in the structure of the picture. It should play its part in the design.

2. The surface should not be brought to a dead smooth level. Very beautiful effects were produced by the light as it played on the variously set planes of the *tesseræ*.

3. A minimum, not a maximum, number of tints produced the happiest result.

4. It should always be remembered that mosaic required a simple, bold, uncomplicated treatment. It was to be seen and judged of from a distance.

5. There must be no introduction of aërial effects or atmosphere, nor a striving after realism. The work was decorative rather than imitative, and its figures, trees, and buildings *symbols* only.

As to fresco work, he presumed that he had been asked to say something on the subject because it had fallen to his lot to arrange for a series of full-size figure compositions in a church he had lately finished.

Fresco really meant a chemical process successfully carried out. According to the system of Herr Adolf Keim, of Munich—which he was led to adopt—an ordinary rough-rendered plaster might be the starting-point. On this was laid the first coat of rough plaster ready to receive the painting-ground. This consisted of quartz-sand, marble-dust, and infusorial earth mixed together, and added in the proportions of eight parts to one of lime, and laid thinly, say about one-eighth of an inch thick. Throughout, care must be taken that the water was free from lime, to which end only distilled water should be used. The under-coat and the painting-ground, or *intonaco*, being perfectly dry, a solution of hydro-fluosilicic acid was supplied, which prepared the material more readily to absorb two successive coats of diluted silicate of potassium, and the surface was ready for painting. The pigments had to be obtained from Herr Keim, or his London representatives, for they were all selected from the point of view of being equally acted on by the alkaline fixing fluid.

Mr. James C. Powell, who read the next paper, confined his remarks to the use of glass in the decoration of walls and roofs, and described the different materials used for glass mosaic, and the making of gold for mosaic work. Having described the materials used for the work, he proceeded to consider the different methods of working. In making the first sketch design for the decoration of curved surfaces, such as domes or vaults, it was best to prepare plaster models to scale, from which the exact effect of the work when executed in mosaic could be obtained, which would be impossible in a drawing on the flat, displayed in the usual way. Then must be settled that most vital question in connexion with mosaic: "Are you going to work it tessera by tessera to the wall itself, or are you going to work it in a studio away from the place it is ultimately to occupy, and in a light different from that it will ultimately receive?" He thought there could be no doubt that the former was the

way in which all the old mosaics were worked, and, from the experience he had gained, it was undoubtedly the best from every point of view. It was a quicker method, and therefore a cheaper way of working; moreover, what was more important, the mosaicist could see his work grow, and take a more intelligent interest in it. Another great advantage was that the tesseræ were once for all placed in position by the mosaicist, and retained the inequality of surface given by the varied pressure of the hand, and the finished work had not the dead-level appearance usually presented by the other methods. After describing some of the work at St. Paul's and elsewhere, he closed with a few suggestions. If mosaic was to flourish and become one of the recognised means of decoration in this country, we must study where to place it to the best advantage in our buildings, and this must not be too near the eye, where fresco and painting would look better. In the old churches of Italy one seldom found it lower than 12 or 14 ft. from the floor line. Designs should be broad and simple, and the draperies designed so that they could be worked in lines of tesseræ, using the joints of the cement, like the lead-lines in stained glass, so that they would assist the drawing. In coloured grounds one could make them play an important part; by widening the joint and showing more cement they could grey their colour, or by not letting the cement show on the surface they got a dark joint and strengthened their colour. In using gold for the grounds of their design they should spread it over all parts of the work, such as patterns on the dresses, &c.; in this way they softened the effect of the outlines, and prevented the object in their design forming silhouettes on the gold ground. The size and shape of the tesseræ were important, and would be controlled by the necessities of the design, and the distance the work was to be seen from the eye.

Mr. G. Salviati described the different kinds of work which had been called mosaic, distinguishing between "inlaid" or marqueterie mosaic, so manufactured that the surface of the work was thoroughly smooth, and monumental or Byzantine mosaic, made by using stone or enamel pieces cut into irregular shapes, which were then put together more or less near to each other, so that between them the joints were seen. This work did not look smooth, but rough. This was the sort of mosaic used by the ancients, and the most fitting and that generally adopted for the purpose of architectural decoration. Giving a short sketch of the history of mosaic, and of Dr. Salviati's revival of the manufacture at Venice, he observed that the old mosaics were worked on the spot they were destined to decorate. The mosaicist, having prepared the surface of the wall and covered it with a layer of cement, produced his subject by putting on the enamels piece by piece: this system of working occupied necessarily a long time, and entailed considerable cost. The method invented by Dr. Salviati was far simpler, and by it they were enabled to produce mosaic work in their establishment in Venice so that it could be conveyed to any place for which it was intended, ready made and quite prepared to be immediately fixed on the cement, whether the position were circular, horizontal, or perpendicular. The subject, after being designed upon paper, was cut into various pieces, which were distributed to different artists, each of whom was employed in covering with mosaic such part of the general subject in which he was specially skilled. These pieces were worked upon paper on the reverse side, and when finished they were packed in cases and sent to the place intended to be decorated. Here the subject was again put together and fixed in the cement on the spot. In this manner mosaic could be produced at convenient cost, and so quickly that this mode of decoration was brought within the reach of all classes. Doubts had been expressed whether mosaic work for exterior decoration would stand a northern climate, especially that of England. He could speak with positive certainty that there were no grounds whatever for apprehending danger. As far as the enamel itself was concerned, *if it were well made* it was absolutely indestructible.

Mr. N. H. J. Westlake, whose paper was read by Mr. W. D. Caröe, said his intention to have given a short paper on mosaic and fresco, in response to their invitation, had been frustrated by an illness; but he promised their secretary to write a few notes, and he herewith sent them. Before commenting on the best way of recovering these arts practically, he said, we should ask ourselves three plain questions:—

1. If it was possible really to revive mosaic and fresco, to make them living arts, and not archæological studies?

2. If it was possible, whether they were the most suitable art media for the climate and the modern condition of arts?

3. Or, whether the more modern methods were not the more durable in this country, as far as their durability could be measured?

The first and second questions involved some sentiment in their consideration; the third was a mere question of fact from ascertained data. Concerning his first point, was there sufficient scope and patronage to support them, even if it were possible to revive mosaic or fresco? He had seen effective modern Russian mosaic, and some secular work in Paris, but that on the new façade of the cathedral at Florence was, in his opinion, weak in the extreme—an attempt at showy effect, miscalculated and misplaced. His impression was that mosaic work was alive to a certain extent as an art in Russia, because it was the result of a tradition nearly unbroken, and was in tone with their architecture and rites, as it was with the Christian Greek. Laying aside for the moment the modern methods of making mosaics in most workshops, where they were manipulated upside down, let them look at it from an æsthetic point of view. Mosaic was not the art for churches with elaborated details and modern rites, with figured musical orchestral accompaniments. A chorus of deep, strong voices in simple tones; an architectural surface almost undisturbed by complicated mouldings, the walls glittering with the facets of the mosaic cubes, forming figures of immense size, of grand and ascetic aspect, monotonous and solemn, as the architecture and rite—that appeared to him to be the home of mosaic. Was that state of art and ritual possible or probable here *in futuro?* Concerning the second and third points, he had often asserted, and still maintained, that a sound wall would hold a painting as firmly as a mosaic. Then why have recourse to a secondary art—a copy—unfitted for their building, when they could have the artist's own delineation as permanently fixed? Fresco, like mosaic, had had much enterprise, talent, time, and money bestowed on its revival, but he had no doubt that it was less fitting and less durable in this climate than many other forms of mural painting. Nothing would delight him more than to see some good new mosaic or fresco, or a school of new mosaicists and fresco-painters; but an art or style once absolutely dead took a lot of reviving. He thought, therefore, that if mural painting continued it would be in modern media.

In the discussion which followed,

Mr. J. D. Crace, in proposing a vote of thanks to the gentlemen who had contributed the papers, said the important subject of mosaic decoration was one which in itself could occupy more than one night, and it was not unnatural that the fresco portion of the subject had been left in the background. But in reference to what had mainly been the subject of the papers—mosaic decoration as they ordinarily understood it—he was very much charmed to hear Mr. Powell's practical exposition of the working, because Mr. Powell himself was artist enough to have a great appreciation of the methods which really contributed to the ultimate artistic effect. One of those was the setting of the mosaic tesseræ themselves—that they should not be on too absolute a plane. Another most important point which had been disregarded by almost everybody who had carried out mosaic on a small scale in this country was that where figures were placed upon a gold ground, the gold tesseræ should be repeated in the garments and accessories of the figures, otherwise the figure would unfailingly be a silhouette, as a dark mass against a glaring mass of gold wherever the light fell strongest. That was a point which had been most carefully thought of in the decoration which was now being carried out at St. Paul's, in which he had the pleasure of spending more than an hour that day through the kind invitation of Mr. Richmond. Another point in reference to gold ground mosaics was that their value was very much diminished directly they were on a flat surface. The gold ground mosaic was really only at its full value when it was either on a curved surface or on a surface which at some point or other merged into a curve. St. Mark's at Venice was perhaps the best-known example of this. There was no portion of the field which was covered with mosaic at St. Mark's, but which was gradually led into a curved formation, either at the angles which were rounded off, or merged into a roof which formed a wagon-headed semi-circular vault. Directly they got a large flat surface of gold ground mosaic, it ran the risk in some lights of looking very dark, although that was very much modified by the proper setting of the mosaic to form an irregular surface. The decorations now going on at St. Paul's were, of course, the most important work of the kind that any of those present were ever likely to see, and any one who had taken some share in it might well be proud. They were being most carefully thought out and most thoroughly studied, both by the artist and by Mr. Powell. If one might criticise it could only be with considerable diffidence and in a most friendly spirit. He thought there was a little tendency in what was done to obliterate some of the features of the architecture, which he did not think should have been quite so much merged in the decoration. In the definition between the mosaic surfaces and the architectural features, such as the rib structures which crossed the vault, and features of that kind, there seemed to him a little want of outline and definition. Another point which struck him, and which he could not help thinking would make itself evident to the artists themselves a little later on, was that the draperies and garments of the figures were over-broken-up; they were not simple enough. On the other hand, the most careful study appeared to have been brought to bear upon the work, and it was one which everyone must watch with the closest interest. He had no doubt that as in every great work there must be much to criticise, so also those who saw it for the first time would be ready to look upon it with a large allowance, recognising the unusual difficulties which must attend a work on such an exceptional scale.

Professor Roberts-Austen said with regard to that most remarkable little church which Mr. Townsend had built at Chilworth, it seemed to him (the speaker) that the chemistry of the process adopted in the fresco preparation was nearly as perfect as possible. Mr. Townsend had very fully described that method, and mentioned that the biting of the ground which received the colour was effected by hydrofluoric acid. That was so in the original description given by Mr. Rivington, but he (the speaker) thought it would probably be found desirable to effect that biting, not by the acid already named, but by oxalic acid, which, although weak, was sufficiently strong to decompose the marble base, and at the same time to form oxalic lime, which would add to the coherence of the mass. Then there appeared to be no difficulty in applying the colours, which were mostly metallic oxides, and fixing them with silicate of potash. It seemed to him, again, not a little remarkable that, although the first description of this method was given at the Society of Arts in February, 1884, this was (he believed) the first piece of work which had been executed by this very interesting and remarkable method. At any time he would only be too glad to give any architect interested in the process any aid he could in carrying out a work of the kind, because it seemed to him to be so singularly interesting.

Mr. J. M. Brydon, as a member of the Arts Committee, seconded the vote of thanks. He said they were especially indebted to Mr. Townsend for the very able manner in which he had explained the principles which should guide the work. It was very gratifying to find that simplicity, dignity, and quietness was the essence of the whole work. Then it was most instructive to listen to such practical expositions of processes of getting this work out *in situ* as given by Mr. Powell. Again, he felt inclined to revert to the old process of sticking the tesseræ in their places on the spot, and not on pieces of paper upside down. All work of this kind must be done on the spot; that was the only way to get the real effect of the work when it was finished. They could not by any possibility get the effect standing in the studio, with the work probably upside down, and then transfer it, say, to the height of the dome of St. Paul's. The real way to do the work was to put the tessera in the place it was to occupy. He understood Mr. Richmond was adopting that plan in connexion with the work at St. Paul's, which must be to everyone of immense interest. The cartoons which were shown and such of the work as had been seen led one only to this conclusion: that it was one of the greatest experiments in mosaic work done in this country for many years, and everyone who loved St. Paul's hoped it would be an immense success. If one might venture on a criticism it would be on the style of the mosaic.

The style, as far as one could gather, was scarcely the style of the church. Looking at it from an architectural point of view, it seemed to him that in a seventeenth-century church the style at Ravenna was scarcely the style of work that should be designed for such a place. But it would be a most interesting experiment, and a most interesting example of work when they found what the real effect was in such a church as St. Paul's. He hoped the architectural lines would not be destroyed.

Mr. Phené Spiers said that thirty years ago, or perhaps more than that, the late Mr. Burges was of opinion that the only proper way to decorate St. Paul's would be to strip off the whole of the mouldings inside and cover the surface with gold mosaic. That was, no doubt, the proper treatment to get a purely decorative effect. The remarks of Mr. Crace had emphasised that. He had pointed out why the mosaic always looked better when it ended in a curve, and anyone who had seen St. Mark's or the church at Chilworth would have observed that they were all based on that principle. Of course, subsequently, when Burges was called upon to make designs for St. Paul's he was limited in his scheme, and attempted to decorate portions with mosaic, and proposed to do what was even worse than what Mr. Richmond was doing. He proposed to cut off 3 in. all over the place in order to cover it with marble. When that was announced his idea was at once regarded as terrible, and it was given up, but he (the speaker) knew that Burges thought over the subject very seriously for many months, and that he had the greatest difficulty in knowing how to bring a forcible style of decoration and colour which would harmonise and not interfere with Wren's architectural lines. He thought it was very fortunate that this idea was not carried out, but he must say that each time he went into St. Paul's he was very much impressed with the immense beauty of the coloured stones; and, so far as the walls were concerned, it was infinitely finer than any marble decoration that could be put on.

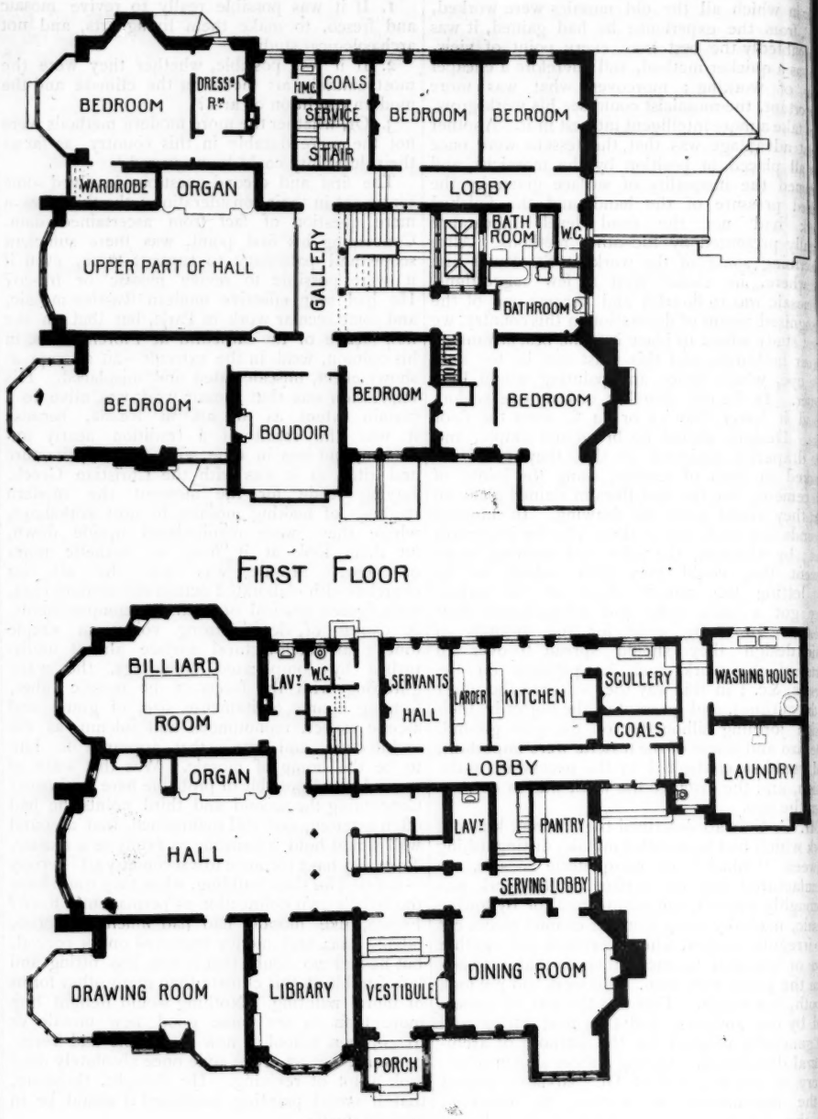
Mr. A. T. Bolton said that, comparing St. Paul's and St. Mark's, the difference between them was that the latter had, practically, no architectural lines at all. It was a great brick carcass, plastered inside with mosaic. On the other hand, the architectural features in St. Paul's were strongly defined by archivolts, entablatures, and pilasters. In St. Mark's the only forms employed were borders of decorative design marked in the mosaic itself at the angles. Consequently it was very likely that, if the lines in St. Paul's were not decorated to some extent, the mosaics would have the effect merely of a series of pictures in panels. That, he thought, was really the effect of the pendentives already executed in the dome, which were very like paintings in fresco; and what Mr. Richmond had evidently aimed at was to give the effect of a mosaic interior to St. Paul's by more or less disguising its lines. Thus, in the apse the dividing bands were gilded and then patterned over in red, so that at a distance they would be lost in the general surface of the gold mosaic background; but inasmuch as gilded stonework, as might be seen by that already gilded in St. Paul's, turned a peculiar tone after a time, getting much darker (which mosaic cubes would not do), it was very likely that, after all, Wren's architectural lines would assert themselves.

The President expressed his appreciation of the papers, and the gratification he had felt in hearing experts emphasise the importance of simplicity in the treatment of mosaic, both in respect to colour and treatment. He suggested that the vote of thanks proposed should be coupled with the names of those who had been kind enough to lend the illustrations hung on the walls—namely, the South Kensington Museum, Messrs. Powell, Mr. Salviati, Mr. Westlake, Messrs. J. R. Clayton, Walter Crane, Aldam Heaton, T. R. Spence, A. H. Hart, A. T. Bolton, and the Venice Glass Company.

The vote of thanks was passed unanimously.

Mr. Powell briefly acknowledged the compliment, and announced that he had received the consent of the Dean of St. Paul's to invite the members of the Institute to visit St. Paul's on Saturday, the 24th inst., between the hours of 2 and 3.30 p.m., so that they might have a proper view, and judge themselves of the work already accomplished.

The President said he would have great pleasure in responding to the invitation, and he had no doubt that many others would do likewise. Any one applying to the secretary would receive cards of admission.



House, Kelvinside, Glasgow.—Plans.

It was then announced that the next meeting of the Institute will be held on Monday, the 26th inst., when papers will be read on "The New Engineering and Physical Laboratories at University College, London," by Professor T. Roger Smith, Professor J. A. Fleming, Professor Carey Foster, and Professor Hudson Beare.

Illustrations.

THE OMEYYAD MOSQUE, DAMASCUS.

THE view is taken from the south-east angle of the south transept, with the north transept on the right, and two bays of the nave on the left. Above, on arches carried by immense piers (10 ft. by 12 ft.), is the dome, carried on pendentives not dissimilar (except that the arches are round) to those found in the church of St. Giovanni degli Eremiti at Palermo.

The earliest parts of the mosque, as shown in the drawing, are the nave and aisles, which are probably those built by Arcadius, 395-408, as recorded in a Greek inscription, found 80 years ago, over the Bâb-el-Jeirûm. The columns which divide nave and aisles (both of the same width) are 22 ft. high and carry arches; above them are openings, two to each arch below, which open into the aisles. It is probable that this arrangement is due to the fact that Arcadius wished to utilise the shafts and capitals of some Roman building, and as these were not of sufficient size to give the height required, the wall was raised in this way; a similar expedient was adopted in the Mosque of Cordoba. The open timber roof may be the original one. The outer wall of the aisle was of similar design, but the columns have been encased at a later period, and fitted with doors and traceried windows.* The arches at a lower level, which terminate the nave and aisles, may also be portions of the early church, as also the north wall of the north transept. The filling in of the windows is probably of later date, though executed by Greek artists for the Mahomedans. The mosaics are also of Mahomedan date, as there are no figures to be found in them. The magnificent ceiling is probably fifteenth or sixteenth-century work. The great piers of the transept were probably built by Walid, the sixth khalif of the Omeyyades, who obtained possession of the church in 705, and who is said to have imported large numbers of artisans from Constantinople, and marble and porphyry columns from Alexandria, and from various towns in Syria. To him is ascribed the dome or pendentives we now see, and it is possible that he extended the mosque by repeating the nave and aisles on the eastern side of the transept. The lower portions of the piers are encased with marble and inlaid with various marbles and faience. The floor is paved with limestone, and in part with tesselated marble, and always covered over with carpets.

The upper portion of the walls was probably covered with mosaic similar to that still existing in north transept wall, but this was probably so seriously injured in 1089, when the church was

* It may seem strange to build a church with its north side open to the wind, but at a later date the dome of the rock at Jerusalem, better known as the Mosque of Osman, was, according to Professor Lewis, thus built, and not enclosed till two centuries afterwards.

damaged by fire, that the remainder was covered with stucco. The dome and gallery beneath were painted in gaudy colours in the last century.

R. PHENÉ SPIERS.

THE SPINELLI PALACE, VENICE.

THE façade of this palace is published here at the request of Professor Aitchison, as an important illustration, referred to in his second Royal Academy lecture (published in the *Builder* of last week), of the architectural advantage of designing windows in relation to the space they have to light, so as to afford some external indication of the nature of the rooms with which they are connected, and assist the exterior architectural expression of the building.

HOUSE AT KELVINSIDE, GLASGOW.

THIS house has been recently erected in a western suburb of Glasgow. The chief feature within is a hall about 60 ft. long, 20 ft. wide, and 35 ft. high to the apex of the roof. One end of this hall is screened off by pillars and arches, and forms the main staircase. At one side in a recess there is a large and fine organ. Another arched recess contains the hall chimney-piece.

The arrangement of rooms on the two principal floors is shown by the plans. On the attic floor there is a range of nurseries towards the front and of servants' rooms to the back. The basement floor contains heating chamber, engine-room, cellars, &c.

The walls of the house are of stone from the neighbourhood of Alloa, of a fine warm greyish tone, the window dressings and corners being of a dark red stone. The framed timber work is filled in with red bricks, the roof being covered with green slates. The framed timber of the gables is filled with yellow-toned cement.

The architect is Mr. T. L. Watson, and the drawing from which our illustration is taken was exhibited at the Royal Academy last year.

SHEFFIELD MUNICIPAL BUILDINGS: SOUTH-WEST ANGLE.

THIS drawing, which was exhibited at the Royal Academy of last year, shows the right hand angle of the principal front of the building. The oriel window and the large windows on the same level are the end and side windows of the Mayor's parlour. Beyond, to the left of the drawing, are seen the first two of the range of windows of the reception gallery.

The ground floor windows are those of offices (auditor, accountant, &c.); the gateway gives access to external stairs leading to some of the basement offices. The plans of the building were published in our issue of June 28, 1890. The architect is Mr. E. W. Mountford.

LOCAL BOARD OFFICES AND FIRE STATION, HARROW-ON-THE-HILL.

THE Harrow Local Board Offices are combined with the fire station, the former on the upper floor, the latter on the ground level, below which are store-rooms and residence for the keeper, who is always ready to answer an alarm and ring the fire-bell, which, as will be seen, forms a conspicuous feature in the design.

There is a "look-out" on the roof which has a very extensive range of view, and this is used also as a meteorological station.

Although the situation is one of the most prominent and central in Harrow, no attempt has been made to add expensive features to the design, which is intended to be simple and picturesque, while showing distinctly the object for which it is erected.

The Local Board is to be congratulated on the purchase of such an excellent site, and on their public spirit and economy in what they have erected upon it, for the cost of these buildings complete was only about 2,000*l*. The architect is Mr. Charles Forster Hayward, of London. The drawing of the building was exhibited at the Royal Academy last year.

COMPETITIONS.

SCHOOL, ROYTON, LANCASHIRE.—The Royton School Board invited four architects to compete for designs of a proposed school. After considering the plans sent in, Messrs. Butterworth & Duncan and Mr. Wolstencroft were invited to a new competition (both to be remunerated), with the result that the plans sent in by Mr. Wolstencroft were accepted.

ARCHITECTURAL SOCIETIES.

EDINBURGH ARCHITECTURAL ASSOCIATION.—The monthly meeting of the Edinburgh Architectural Association was held on the 7th inst. in the Royal Institution, Princes-street. Mr. W. W. Robertson, President, occupied the chair. Mr. J. M. Gray, F.S.A. Scot., Curator of the Scottish National Portrait Gallery, read a paper on "Engraving on Metal: its Technical Processes and Artistic Results." The lecturer considered in detail the various processes of engraving on metal, and the artistic results which they yielded. The method of line engraving Mr. Gray styled as *par excellence* the classic mode of engraving, and stated that its highest function lay in translating into black and white, by the most careful, finished, and accomplished method, the great masterpieces of the painter's art. It was noticed that the early line engravers were original artists, who reproduced their own designs, and special reference was made to the plates engraved by Martin Schongauer, Van Mecken, Albert Durer, and Lucas Van Leyden. In Marc Antonio they had, however, an early engraver who devoted himself to reproducing another artist's work — the designs, namely, of Raphael. The line engravers of France and Holland of the seventeenth and eighteenth centuries, and the great school of English line engravers who reproduced the landscapes of Turner, were dealt with, and the technical processes of etching were explained. Etching, he said, was pre-eminently a process for sketches, in which the line should be used with the finest selection, and be as expressive as possible. Rembrandt was instanced as the great master-etcher, and reference was made to the modern revival of etching as an artistic process in France and England. Mezzo-tint was the last method with which the lecturer dealt, a process fitted for realising perfect tonality, and, as it worked by spaces, not lines, for rendering the breadth of effect that is attained by the painter's brush. Reference was made to the magnificent renderings of Reynolds' portraits by this process, and to its use by Turner and Constable in reproducing their landscapes. A vote of thanks was accorded to Mr. Gray at the close of the lecture.

SHEFFIELD SOCIETY OF ARCHITECTS AND SURVEYORS.—The monthly meeting of this Society was held on Tuesday evening last at the Technical School, where the Principal of the School, Prof. Ripper, M.I.M.E., delivered an address on "The Testing of Materials." The Professor first conducted the members of the Society through the school and explained the working of the various departments. An adjournment was then made to the testing-room, where the Professor explained the construction and method of using the testing machine, and afterwards conducted a series of experiments. These were of a practical character, and included tests for cast-iron by tension, crushing and breaking a transverse test-bar. Mild steel and wrought-iron were also subjected to the tensile test. Samples of red deal were broken transversely and crushed. The crushing-test was also applied to a sample of the ordinary red brick used in the neighbourhood. Lists of the experiments to be shown were distributed to the members; these gave the usual breaking weights of the various materials and spaces in which to record the results of the experiments witnessed. At the close of his address, the Professor drew attention to the facilities afforded by the school for the pursuit of many branches of study necessary to the young architect, and expressed his willingness to meet the requirements of the architectural students by arranging for other classes if this were thought desirable by the Society.

ENGINEERING SOCIETIES.

THE JUNIOR ENGINEERING SOCIETY.—The last visit of this Society was to the Battersea Polytechnic Institute, on the invitation of the Principal, Mr. S. H. Wells, Wh. Sc., by whom, with Mr. W. G. Walker, a large party of members were shown over.—At the meeting of the Society held on the 9th inst., a paper was read by Mr. A. H. Dykes, A.I.E.E., on "The Construction and Working of Electro Motors." The author commenced by stating that, whenever a current of electricity is passed through a conductor lying in a field of magnetic force, as between the poles of an electro-magnet, the conductor has a tendency to move across the field. If the force is sufficient to overcome the opposing forces and move the conductor across the field, an electro motive force is set up in it, and the potential difference required to send the current through it is increased by the amount of this back E M F, or $P D = e + cr$ where r is the resistance of the conductor. The work done is $P D \times C = e c + c^2 r$, e c being the equivalent of the mechanical work done in moving the conductor, and $c^2 \times r$ the power wasted in heat. It was then shown how this simple motion of translation can be converted into a motion of rotation, and the function of the commutator was explained. The torque exerted by a motor was seen to be dependant on the number of conductors on the armature, on the current passing through it, and on the strength of field produced by the field magnets. The various ways of winding the electro-magnets were dealt with and the relative advantages of shunt and series motors for different requirements considered, examples being taken from tests of the City and South London Railway motors. The paper concluded with a description of the faults most likely to occur—"earths" and "shorts" and the best means of determining and repairing them. Specimens of parts of electro-motors were exhibited.

SOCIETY OF ENGINEERS.—The first ordinary meeting of the Society of Engineers for the present year was held on the 12th inst., at the Town Hall, Westminster. Mr. W. A. McIntosh Valon, J.P., the President for 1893, first occupied the chair, and presented the premiums awarded for papers read during his year of office, viz.:—The President's Gold Medal to Professor V. B. Lewes, for his paper on "Gas Substitutes." The "Bessemer Premium" to Mr. R. Nelson Boyd, for his paper on "Collieries and Colliery Engineering." A "Society's Premium" to Mr. E. G. Mawbey, for his paper on the "Leicester Main Drainage, &c.," and "Society's Premium" to Mr. Robert Carey for his paper on "Hydraulic Lifts." Mr. Valon introduced the President for the present year, Mr. George A. Goodwin, to the meeting, and retired from the chair, receiving a unanimous vote of thanks for his services during the past year. The President having taken the chair, prefaced his address by referring to the satisfactory progress and condition of the Society, stating that its position was better than it had ever been, and that the *raison d'être* of its existence was a worthy and a much appreciated one, viz., to hold out a helping hand to the younger members of the profession, to offer them special inducements in taking part in the discussions on the papers read at the monthly meetings, and the making of the annual summer visits to works of engineering interest, under construction or completed, where again useful information was obtained, and of special value to the younger members. After referring to last year's visits and the work of the Society, he commenced his address proper, which dealt with the present position and practice of mechanical engineering. In conclusion, he gave a few words of advice to the younger members who had elected to follow the noble profession of an engineer, recommending a sound practical training by day with theoretical study in evenings; to follow up some speciality to the hilt, but at the same time to obtain and maintain a good general knowledge of other branches, and stated in the words of Francis Bacon—"I hold every man a debtor to his profession; from the which as men, of course, do seek to receive countenance and profit, so ought they of duty to endeavour themselves by way of amends to be a help and ornament thereunto."

ROMAN ROCHESTER.—During the excavations carried out in connexion with the rebuilding of Sir Joseph Williamson's Mathematical School at Rochester, an interesting archæological discovery was made. It was found that the Saxon work of the old city wall and Eastgate Tower rested on Roman foundations, and during the progress of the operations Roman remains were opened up to a considerable extent. The Rochester Town Council have now taken steps to preserve for public inspection these interesting works of the Roman and Saxon periods of the history of their ancient city. A strong desire was manifested to continue the investigations and to further open up Roman Rochester, but the Corporation came to the conclusion that they could not fairly and legitimately devote the money of the ratepayers to this purpose. Therefore, whilst they are doing all that is necessary to maintain access to the Eastgate Tower and the other ancient relics, the Corporation have decided to leave any future researches to antiquarian and kindred societies.

A NEW WRAPPER.—The "Patent Strip Wrapper Syndicate" have sent us a wrapper for cylindrical packets, which has a double row of parallel punctures half-an-inch apart, by means of which the slip of paper between can be torn off and the wrapper unfastened in a moment, without any of the delay and occasional danger of injuring the enclosure by cutting at the wrapper to get it off. The patent is on the same principle as the punctured divisions for postage stamps, and is likely to be very useful.

THE LONDON COUNTY COUNCIL.

THE usual weekly meeting of the London County Council was held on Tuesday in the County Hall, Spring Gardens, Mr. John Hutton, the Chairman, presiding.

Loan for Electric Lighting.—The Finance Committee recommended that the application of the Vestry of St. Pancras for a loan of 30,000*l.* (inclusive of the sum of 15,400*l.* previously sanctioned) towards defraying the cost of electric lighting works in the parish, be granted to the extent of 29,700*l.*, on condition that it was repaid within a period of twenty-five years.

Mr. Charles Harrison (vice-chairman) moved—

"That the recommendation be referred back to the Committee, with an instruction that as the loan will be expended, not for renewals, but for initial cost in establishing electric lighting works which are income-producing and remunerative, it is advisable that the loan should be made for the full term sanctioned by Section 7 (iv.) of the Money Act, 1892, for electric lighting purposes, namely, forty-two years."

Mr. McCall seconded the amendment, which, after a long discussion, was, on a division, defeated by sixty-one votes against thirty-six.

Dr. Collins then moved, and Mr. Benn, M.P., seconded, an amendment to the effect that "thirty years" be substituted for "twenty-five years" in the recommendation.

On a division the amendment was rejected by forty-nine votes against forty-four. The recommendation of the Committee was then adopted.

West London Tramway Bill.—A report was brought up of the Highways Committee, which stated that the West London Tramways Bill proposed to authorise the construction of tramways from the existing line (of the West Metropolitan Tramways Company) in Uxbridge-road, along Askew-road, Paddenswick-road, and Church-road, and portions of the Broadway and the Hammersmith-road, to the building known as Olympia. Several other short connecting lines were also projected. Some of the roads through which it was proposed to lay those tramways were narrow. In six places there would on both sides of the street be less than the statutory width of 9 ft. 6 in. between the rail and the kerb, and in one place that space would be on one side only. They were of opinion that, in the circumstances, the proposals in the Bill were not such as the Council should approve, and they accordingly recommended: "That the consent of the Council be not given to the introduction into Parliament of the West London Tramways Bill." This was agreed to.

Expenses Incurred by a District Surveyor.—The Finance Committee brought up a report containing the following paragraph:—

"On November 21, 1893, the Council, on the recommendation of the Building Act Committee, directed that the sum of 42*l.* 8s. 11d. be paid to Mr. Crow, District Surveyor for Whitechapel. The amount named is the balance of the costs incurred by Mr. Crow in respect of proceedings taken against builders (twenty-eight summonses being taken out) for using bad mortar in the erection of some warehouses in Sheppy-yard and Haydon Hill, and a public-house in Whitechapel High-street. The total sum expended is 265*l.* 4s. 11d., and the amount recovered from the defendants 222*l.* 16s., leaving a difference of 42*l.* 8s. 11s., which arises not from failing to recover any part for which the defendants were liable, but from Mr. Crow's solicitor and client costs exceeding the amount of the fines and costs allowed by the magistrate, and it is in consequence thereof that Mr. Crow asks the Council to pay this deficiency. We have had to consider whether there is any legal liability on the Council to pay this amount, and, the solicitor having reported to us that there is no such liability, we are under the necessity of reporting that fact, with an intimation that, as at present advised, we are not prepared to recommend the payment of the amount."

Mr. J. W. Benn, M.P., moved that the paragraph should not be received, on the ground that the money was clearly due to the Surveyor, and should, therefore, be paid.

Mr. Strong seconded, and, after some discussion, the amendment was agreed to unanimously.

Electric Lighting of the Victoria Embankment.—The Highways Committee reported that—

"The drawings for the installation works for the lighting of the Victoria Embankment and Gardens and Westminster and Waterloo Bridges, as authorised by the Act of last Session, are in course of preparation, and will shortly be so far completed that the specification and estimates may be prepared. In the meantime it appears to us that the work of laying the necessary conduits and forming the refuges round the lamp columns can be proceeded with at once. The Chief Engineer's estimate of the cost of this preliminary work is 2,100*l.*; and we recommend—

'That, subject to an estimate being submitted to the Council by the Finance Committee, as required by the statute, the work of laying the necessary conduits and the forming of the refuges round the lamp-columns in connexion with the electric-light installation for the Victoria Embankment, &c., be carried out by the Council without the intervention of a contractor; and that the plans, specification, and estimate be referred to the Works Committee for that purpose.'"

Mr. Lloyd moved to refer the recommendation back, on the ground that the high lamp-posts which it was proposed to place in the middle of the roadway would greatly disfigure the embankment.

This view was taken by several other members of the Council, and the amendment was adopted on a show of hands by 33 votes against 20.

Chelsea Embankment Extension.—The report of the Improvements Committee contained the following paragraph in reference to Chelsea Embankment extension:—

"The Council on July 28, 1890, decided to apply to Parliament for power to extend the Chelsea Embankment westward, subject to a contribution by the Vestry of Chelsea of one half of the net cost, which, at that time was estimated at 62,000*l.* As, however, the Vestry declined to contribute more than 8,000*l.*, the application to Parliament was not proceeded with. Since that time we have received several applications from the Vestry for a reconsideration of the suggested improvement. After considerable negotiation the Vestry offered to contribute 8,000*l.* and to do the necessary filling-up work connected with the formation of the new embankment. We informed the Vestry that we were prepared to recommend the Council to take the necessary steps for carrying out the improvement, including the necessary filling-up, if the Vestry would contribute one-third of the net cost, which at the present time is estimated at 64,000*l.* We have now received a letter from the Vestry stating that, in view of the proposed alteration in the source of taxation for London improvements, it has decided to withdraw its offer to contribute towards the cost. In these circumstances we have resolved to take no further action in the matter."

Protection from Fire in London.—The Fire Brigade Committee presented a report as to the additional protection from fire in London, which, as it involved the expenditure of more than 5,000*l.*, stood over until next week. It recommended the establishment of a river station at Battersea, fifteen new fire stations, and a number of new sub-stations and fire-escape stations, at an estimated cost of 92,570*l.* on capital account and 24,300*l.* for maintenance. Allowing for redemption of capital, &c., the total increased annual cost of the Brigade would be about 29,000*l.*, or something less than a farthing in the pound.

The Council then adjourned.

THE LONDON STREETS AND BUILDINGS BILL, 1894.

ON the 5th inst. Mr. Henry Blackbourn read a paper on "The London Streets and Buildings Bill, 1894," at a meeting of the Surveyors' Institution. The author said that he proposed to refer to a few of the more salient points of the proposed Act, and to divide the subject into four heads:—1. A consideration of the lines legislation should follow. 2. The new points which have of late years arisen for legislation. 3. Alterations that were needed and have been made. 4. Alterations that appear weak, or, in some cases, too severely stringent, and in others confiscatory, and which it is to be hoped will be revised before the Bill passes into law. After paying a tribute to the useful service the Act of 1855 had rendered, and referring to the confusion that had arisen from the later Amendment Acts, the author, in considering the first head of his paper, said the first and in one way the most important proposal—for it affected all the rest—was the proposed establishment of a tribunal of appeal. This would probably meet with general approval, as calculated to inspire public confidence, and as tempering the vast discretionary powers vested in the Council. . . . . The proposed tribunal was to be composed of five members, appointed respectively by, the Government, the County Council, the Institution of Civil Engineers, the Royal Institute of British Architects, and the Surveyors' Institution. None of these five might be a member or officer of the Council. As a tribunal of appeal on the many questions before the Council, it was, with perhaps one exception, all that could be desired. That one exception was the assessment of compensation for land and buildings taken and for trade affected, and if the Bill passed there would be many and important decisions of that kind to be settled. . . . . There was only the representative of that Institution who would in any direct way be considered an expert here. . . . Under the third head of his paper the author said that Section 68 rightly dealt with railway arches where used for habitable rooms. There could be no doubt that the exemption of railways from the Act of 1855 had been abused by the Companies. . . . . It was to be wished that the Council had sought power in this Bill over staircases and gangways, so that catastrophes, as that on a Bank-holiday at Hampstead some two years back, might be avoided. Section 78 was of importance, as it reversed, and he thought wisely, the existing law that independent of a right of easement or prescription the adjoining owner has no claim to support for buildings. It was easy to see how this law had arisen, but it seemed that the time had come to reverse it, and few could be aggrieved as it was surely fair that those holding urban land should meet the responsibility that seemed rightly attached to such property. . . . Section 176 required all advertising tablets to be of fire-resisting materials, and so placed as not to cover more than a quarter of the area of any window. This, besides being a precaution against the spread of fire, would discourage the making of the front into one gigantic advertising hoarding. . . . Section 43 required that floor-joists, trimmers, &c., should be of a sufficient scantling, and they were put at figures that should almost content even a speculative builder. But one was at a loss to understand why these should be given, and the girders and columns that carry whole buildings be omitted. Would it not have been well to have given, say, a ruling proportion for depth in centre relative to the span; the tensile and compressive strains per inch super to which the flanges were to be calculated, both for iron and steel, for those carrying walls and for those carrying floors? It was in these points that builders mostly trespassed, yet the District Surveyors were still left without definite guiding directions. In dealing with the fourth head of his subject, the author said Section 7 proposed to enact that if the Council deemed it expedient, certain roads must, if made at all, be made of such greater width than 40 ft. as they in the public interests may require; but they cannot require a greater width than 60 ft. For the development of an estate, and for the sites immediately abutting upon the said road, and for the neighbouring roads of the estate of the owner proposing to form the road, 40 ft. might be an ample width. Yet in the public interest the road might be required of greater width, and this public improvement was to be at the cost of the private owner, both as regards land and cost of formation. Nothing was said of compensation either in this part of the Bill or in the powers of the Tribunal of Appeal. Again, why should the width required be limited to 60 ft? Although that made a good wide road, there were times when a still greater width was necessary for an imposing thoroughfare. . . . But even more confiscatory was Section 13, which proposed to enact that "in case of any building which shall in any part thereof project beyond the general line of building in a street or beyond the front of a building wall or railing on either side thereof shall at any time be taken down to an extent exceeding half of such building (such half to be measured in cubic feet), or shall be destroyed by fire or other casualty, or demolished, pulled down, or removed from any other cause to the extent aforesaid, it shall be lawful for the Council to require the same building or any new building erected on the site or any part of the site thereof to be set back to such a line and in such manner as the Council shall direct." "The Council shall make compensation to the owner of such building for any damage and expenses which he may sustain and incur thereby." So far so good; but was that broad and clear enough to include the various losses to the owner? It might be that the site taken might be so reduced as to be no longer large enough for rebuilding at all, and might leave but a small and odd-shaped piece of practically useless land; so that the business, good-will, and perhaps licence might be swept away too. These were not mentioned, though the words "compensation" and "expenses" would, perhaps, cover them; but they might, with advantage, be clearly and definitely expressed, especially so when we find that the next paragraph runs, "Provided that the tribunal in assessing the amount of such compensation shall take into consideration any increased value or improvement which may accrue to the building or other property of the same owner by reason of the setting back of the building." A possible contingency of betterment that might cheapen the property was set out at length, but the various

claims of the owner were shadowed forth in the words "compensation" and "expenses." That evidently needed re-drafting. Was not the whole of this latter portion of Part I. of the Bill (from Sections 7 to 14 inclusively) drawn with such evident disregard of private rights as to justify the adjective "confiscatory"? Section 30 required that every new domestic building—and this term included shop property—shall have in the rear a 10ft. wide open space throughout its entire width; this may only contain above the level of the ground a water-closet or earth-closet, and ash-house, not exceeding 9 ft. high. This prevented carrying shops throughout the entire ground-floor area, as was so often done, and to which he for one saw no objection. As they had to be top-lit, they were usually covered with lead or zinc flats, and could be easily traversed in the event of fire, and provided lean-to skylights against the back main-wall of house did not extend the whole length, they often formed in such cases an excellent means of escape at back first-floor level. The Metropolis Management and Building Act of 1882 now in force did not forbid such continuation of shops over the whole of the back area, as the space there required to be "above the level of the ceiling of the ground-floor story," but there was no such saving clause in the proposed Bill. Might it not well be inserted? . . . Section 31 provided that a domestic building, fronting a street less than 40 ft. wide, and erected upon a site which at the commencement of this Act or within seven years previously, has been occupied by a domestic building shall not be subject to the provisions of the Act prohibiting the erection at less than the prescribed distance, provided a clear space, which may be enclosed with a wall not over 7 ft. high, be left between such external wall and the centre of the roadway of not less than 20 ft., or if the building exceeded 40 ft. not less than half the height of such building; or put briefly, the building was to be set back, but the space so obtained by setting back might be retained by the owner as a forecourt. But mark, no compensation for depreciation was so much as suggested. The public improvement was to be made at the expense of the unlucky owner. The effect would be to leave a number of forecourts or waste places of little advantage to the public (except for additional light and air) and certainly none to the owners, while the loss would in many cases be very great, as the site, especially when the new regulations as to open, unbuilt-on spaces in the rear were considered, might not allow of buildings being other than very shallow, and this, not in new streets only, but in perhaps crowded thoroughfares that have long existed. Again, having once got all the buildings set back free from expense or compensation, at how much less cost could these forecourts afterwards be taken into the public path, and the roadway widened. . . . Section 38 proposed to enact that no building shall be of greater height than the distance across the road to the building opposite. Some, whilst agreeing with this as a general rule, would yet wish an exception made in the case of corner buildings, on the ground that these afforded opportunity for more effective architectural treatment, and that as the sites were more costly, it was but reasonable that more should be expended on the buildings. There was much in this view, especially as light and air were gained here by the side road joining. It might, however, be urged on the other side, that if it was a site worthy of a specially effective building, reference could be made to the Council, or finally to the Tribunal of Appeal, and if it was not worth that trouble and expense it could not be worth seriously considering. Still it might be well to have a saving clause permitting, say, 30 ft. from the angle each way being carried up an additional 12 ft. or so, and the roof of same to an angle not exceeding 75 deg. In the schedule of thicknesses of walls there was an alteration that would largely affect small suburban house property. At present walls not exceeding 25 ft. in height and 30 ft. in length may be one brick thick. This would be so still if there were not more than two stories, but if there were three then the bottom one must be a brick and a half thick. He maintained that if an alteration was made, it should be just the other way about, for a wall the said height was more tied by the floors where there were three stories than where there were but two. Surely the weight goes for nothing, for 9 in. in this class of work was strong enough in either case. The unsuitability of 9-in. brick was, in such cases more in its failing to resist damp. The strength in the tying in by joists was certainly not durable, and he would have gladly welcomed a section, banishing wall plates and ends of joists from external as from party walls. The disadvantages would be the slightly greater cost, and a great loss in the tying together of walls, but walls should not be tied in by floors, or together by plates, but by party- and cross-walls. . . . Section 55 required that every habitable room should be built in future 8 ft. 6 in. high instead of 7 ft., as required by the presen Act; and that half the area of each room in the roof of any building should be at least 8 ft. 6 in. high instead of 7 ft. as at present; also that the superficial area of windows should be one-tenth the floor area of the room, of which one-half must be made to open; and for rooms in a roof one-twelfth area of room should be the window-area and half opening, or it might be lighted by a lantern light, of which a portion equal to at least one-twentieth of the floor area can be open. This was all as it should be for good and healthy rooms. Yet, was not the standard pitched too high? It would, perhaps, have been well to have raised the mimimum height of rooms to 8 ft., and for attics half the area to 7 ft. 6 in. high; also the opening areas as proposed, but the lighting areas might have been less. It was only for bedrooms such legislation was required, and a full light was not there as necessary as in living rooms. This enactment, if it became law, would increase the cost of houses rented from 28*l.* to 40*l.* per annum, about 10 or 12 per cent., and houses of this size were those in which perhaps half of the population of the Metropolis dwelt; this must in its turn, increase the rents, and make families endeavour to do with fewer rooms, thus causing social evils. . . . But if the first three paragraphs of this section (55) were open to criticism, what should be said of Sub-section D, which would enact that, "Every habitable room, the windows of which do not directly overlook a street of at least 30 ft. in width, shall be so constructed as to be lighted by a window, or windows, or by a skylight, whereof a total superficies clear of the sash frames, equal to not less than one-twelfth of the floor area of the room, shall be above an imaginary line drawn downwards at an angle of 45° with the horizon from the top of the parapet, or from the eaves of any building directly opposite to such window." This would often prevent dining and such rooms, that were chiefly used in the evening, clerks' offices, and counting-houses, being economically planned; whilst it would prevent any bedrooms or reception-rooms in residential flats and model-lodging-houses on any but the top floor being lighted from areas; and when it was considered that such would now all be bottom ventilated, and that in flats many rooms were only occupied for some two months in the year, by those spending only the season in town, it would be seen that this proposal was somewhat fussy. . . . It had been stated that the County Council had declared that, save for verbal alterations, the Act must stand or fall as it is. If this meant that such verbal alterations were to be but casual and slight, it was to be hoped the Bill would be thrown out. But if the needed alterations could be so made, so as to render justice to those at whose expense contemplated improvements were to be effected, and to effect the rectification of some small points, such as those he had directed attention to, he, for one, should wish well to the Bill.

CLERKS OF WORKS' ASSOCIATION OF GREAT BRITAIN:

ANNUAL DINNER.

THE eleventh annual dinner of this Association was held on Monday evening at the Holborn Restaurant, where a large company sat down, under the presidency of Mr. James Brooks, Vice-President, F.R.I.B.A.; the vice-chair being occupied by Mr. J. Aitchison. The loyal and patriotic toasts were proposed from the chair, that of the "Army, Navy, and Reserve Forces" being responded to by the secretary, Mr. Dashwood. In proposing the toast of "The Architects and Surveyors," Mr. J. Brady, congratulated the Association on having had so long a succession of gentlemen eminent in the architectural profession to preside at their annual banquets, the list including Professors Rogers Smith, Banister Fletcher, and Mr. Chatfeild Clarke, Mr. J. Macvicar Anderson, Mr. Ch. Barry, Mr. Webb, Mr. Blashill, and concluding with their chairman that night, Mr. Brooks. He thought the architect should always endeavour to make friends of their clerks, and in order to gain their confidence and secure from them good work, they should always deal directly with their clerks of works. The toast having been duly honoured, Mr. C. J. Jones briefly responded for the architects, and Mr. John Leaming responded for the surveyors.

Mr. Leaming said the quantity surveyor had to work very hard. There were no eight-hour days for him, but rather days of eighteen hours' labour. He was expected to know everything, and the duty he had to perform was generally not only imperfectly appreciated but badly paid.

The Chairman next proposed "The Clerks of Works' Association," calling upon Mr. Aitchison, the President, to reply, after the toast had been duly honoured.

Mr. Aitchison referred to the circumstances which led to the formation of clerks of works' associations. At one time architects had to advertise and to incur a considerable amount of expense before they could find the men they required to carry out their ideas. Now, that Association, with rules so drawn up that none but those qualified should be admitted as members, had been formed, the proper class of men were easily found. Black sheep were to be found in all other flocks, but there were none in theirs. The duties of a clerk of works were very different thirty or forty years ago from those of to-day. New questions were arising every week, and specialists were being constantly multiplied in matters connected with building construction. Heating, electricity, and sanitation were only a few of the subjects the clerk of works was expected to read up and study. The rates of remuneration had not increased in the same proportion, in proof of which fact he adduced an advertisement which had recently appeared demanding a clerk of works from the country possessed of every professional accomplishment, of good temper, and with a character which, like Cæsar's wife, must be above suspicion. For this paragon the salary offered was 50s. per week.

Mr. Wilkinson proposed "The Visitors," coupling with the toast the name of Mr. Stanton W. Preston, clerk to the Carpenters' Company.

The toast having been received, Mr. Stanton W. Preston said that although the Clerks of Works' Association showed that it appreciated the privilege of using the great hall of the Carpenters' Company, it was none the less the fact that the Carpenters' Company was under equal obligations to the Clerks of Works' Association for the advice given by them in the examinations. The importance of these examinations was growing year by year, and the certificates were looked upon as every year more and more valuable.

"The Worshipful Company of Carpenters" was proposed by Mr. W. Baker, and replied to by Professor Banister Fletcher, who, after referring to the good work done by the old Corporations in building up gradually during the last 700 years the greatest city in the world, said the Carpenters' Company did not rest on the laurels of the past. For the past seven years they had supported the technical classes at Kings' College, and every year there was some fresh work demanding the support of the Company. Since last year they had started a great work at Great Titchfield-street. The old city companies would sometimes think for years over a project before acting, but when they acted they were seldom obliged to ship the rudder. They had established joinery classes and carpentery classes containing respectively twenty-two and twenty-four pupils, a like class for tiling and brick-laying, and some forty students in other branches of manual education.

Mr. S. E. Wallis proposed a toast to the Hon. Treasurer, Mr. J. Oldrid Scott, which was responded to by Mr. P. Shaw. The last toasts on the list were "The Press" and "The Chairman." In proposing the former toast, Mr. T. Simpson said he could not sit down without referring to their very good friend, the late sub-editor of the *Builder* (Mr. L. J. Dessurne), whose loss they all deplored.

CENTRAL ASSOCIATION OF MASTER BUILDERS OF LONDON.

THE twenty-second annual general meeting of this Association was held at the offices, 31 and 32, Bedford-street, Strand, on the 9th inst., Mr. Frank May, J.P., President of the Association, in the chair. The Secretary, Mr. Richard S. Henshaw, read the audited accounts and the report. The Council expressed their regret at the death of their late Secretary, Mr. E. S. Henshaw, who for so many years had faithfully served the Association and held the esteem of all. The Council were glad to be able to congratulate the Members of the Association upon the support it had met with from the influential portion of the trade during the last twelve months, there being few builders of consequence who were not members. The Association, whilst guarding the interest of the trade, had endeavoured in the many negotiations and conferences with the delegates from the various

trade societies, to act fairly towards all parties. In consequence of a paragraph in the report of last year, in which reference was made to the payment of workmen leaving work of their own accord, which was somewhat ambiguous, the Council, at the request of the Secretary of one of the Trade Societies, called a meeting of one representative of each trade, which was attended by all except the carpenters and joiners, when the following rule was signed :—

Rule 5a.—"Any workman desiring to leave work during the week shall be entitled to receive his money at 5 p.m., as provided for by Rules 5 and 7, subject to his having given the foreman notice before 12 noon. Notwithstanding the above arrangement, in the event of more than 10 per cent. of the workmen of each trade employed at the shop or job giving notice to leave during the week, they shall not be entitled to receive their money until the usual time on the following Saturday."

The Council regretted to report that the reduction of working hours, together with an increase of wages, had not had the anticipated effect of promoting greater activity amongst the workmen ; complaints were continually being received of the indolence and apathy of the workmen of all trades. In accordance with the instructions of the Council, the Standing Committee on Trade Questions called a conference with the bricklayers, carpenters and joiners, labourers, masons, painters, plasterers, and smiths to consider several local strikes which had taken place in connection with certain trades, and had been the cause of much friction and annoyance, more especially as it was understood that such strikes had been promoted by local lodges. The conference was held on July 18, and a long discussion took place. In the end it was decided that the representatives of the various trades should meet with the object of trying to form some central authority without whose sanction no strike should be allowed. The trades which had given the most trouble were the bricklayers and plasterers. The operative plasterers had been in communication with the Council with reference to apprentices, and as the Council considered that it would be in the interest of the trade to have a greater number of apprentices they informed the National Association of Operative Plasterers that they would be pleased to confer with them on the subject, but, as a very large number of master builders did not do their plastering, but sub-let it to master plasterers, they wished the Master Plasterers' Association to be consulted. This, however, the operative plasterers declined to do, consequently the matter was still in abeyance. . . . . The Council had had under their consideration the Plumbers' Registration Bill, the Employers' Liability Bill, the Conspiracy and Breach of the Peace Bill, the Hours of Labour Bill, and the Notice of Accidents Bill. With regard to the former, Mr. Lee Knowles, M.P., who was in charge of the Bill, had promised to take the necessary steps to include the Institute of Builders with the various bodies from among whom members of the General Council on Plumbers' Education and Registration may be elected. With regard to the Hours of Labour Bill, and the Notice of Accidents Bill, the Council presented petitions against them, the latter Bill being subsequently withdrawn. As the Conspiracy and Breach of the Peace Bill would probably be favourable to employers of labour in the event of strikes, no action was taken. As members were aware, the Employers' Liability Bill, after passing the House of Commons, was sent back by the House of Lords with various amendments, with which the Commons disagreed, and sent the Bill up again with their reasons for disagreeing. The Lords have since decided to insist upon their amendments. In accordance with the rules it would be necessary to elect two auditors and three elected members of the Council. The three elected members of the Council who retired were Messrs. Wm. Scrivener, R. Thorn, and B. E. Nightingale—all of whom were eligible for re-election.

After discussion it was resolved unanimously : "That the audited accounts and report of the Council for the past year be received and adopted." The retiring members of the Council and the auditors having all been re-elected, the proceedings terminated with a vote of thanks to the Chairman.

WESLEYAN CHAPEL, READING.—A new Wesleyan chapel has recently been opened at Reading. The building is situated in the main thoroughfare, has cost about 4,500*l.*, and has been carried out from the designs of Mr. F. Boreham, of London, by Mr. Samuel East, builder, of Reading.

ARCHÆOLOGICAL SOCIETIES.

BRITISH ARCHÆOLOGICAL ASSOCIATION.—At the last meeting of the Society, held on February 7, the chair was taken by Mr. Allan Wyon, F.S.A., Hon. Treasurer. It was announced by Mr. Loftus Brock, F.S.A., Hon. Secretary, that an invitation had been received from the Lord Mayor of Manchester for the Association to hold this year's congress in that city, and that the invitation had been accepted. Mr. Cecil Davis described some finds of prehistoric stone implements near Auckland, New Zealand, and exhibited two examples. The Rev. J. B. Lewis reported the existence of an early font at Tolla Porcorum Church, Dorset, which he supposes to have been a Roman altar. Mr. Barrett described a Mediæval column, now in a cellar at Castle Hedgingham. Dr. Fryer rendered a description of the casting of the bells of Llantrissant Church, S. Wales, in the tower of the church, in 1718. This led to a discussion with respect to the custom of casting bells on the spot by various itinerant bell founders, and many instances were reported. Among these, Mr. Earle Way described the Bell-pit Field at Templeton, near Tiverton, where the church bells are believed to have been made. A paper on Ecclesiastical Antiquities was then read by Mr. A. Oliver, illustrated by an exhibition of many examples of crucifixes, and other objects of varying dates, indicating much diversity of design. Various positions of the Saviour's head were shown, and in one example both hands were placed over the head. Some of the crosses were made to open to contain relics, and an example, found in the Minories, had three cherubs' heads at the extremity of each arm of the cross. Among the examples was an elegant Pax of fourteenth-century date, in a framework a century or two later. The second paper described an antiquarian tour in East Anglia made by Mr. T. Cann Hughes. Many of the lesser known churches of the district, as well as others famous for their architectural beauty, were described.

Correspondence.

To the Editor of THE BUILDER.

PARTY STRUCTURES.

SIR,—I shall be glad if you will allow me to direct attention to the "rights of building and adjoining owners," as dealt with in Part VII. of the proposed London Building Act, 1894. Building owners, who have wished to be able to read the law more easily than by cross-reference to a number of Acts, and who have thought that there are faults in some places, will find that the Bill does not merely consolidate, but alters and adds to existing provisions. Clauses from the various Acts have been brought together, and there are novelties also.

The building owner will have, by express provision, the right (in some cases the duty) of underpinning his neighbour's building—not only the party structures as at present, but other parts as well. Perhaps he will regret that he will have to deal, not only with an adjoining owner but, with all the lessees and occupiers of the adjoining building, when he has to compensate them all. Perhaps he may at times find it difficult to commence his work, within six months of the service of the notice which started the negotiations. This may well be the case when the contract cannot be entered into till the awards of a number of sets of surveyors have been made. If the six months pass without a good beginning, all negotiations and awards will be invalid, and he must begin again. Umpirage will be substituted for the joint award of surveyors, which has been the rule for about forty years. These and other provisions show no desire to adhere closely to existing customs.

The changes may be wisely conceived ; but, as anything which seems to put fresh burdens on the building owner may discourage building, it would be well if the balance of public benefit could be ascertained. Take, for instance, the case of underpinning just alluded to. When it is intended to carry down any portion of a new building within 10 ft. of another building to a lower level, the building owner may be compelled (subject to award) to deal with the whole of the foundations of his neighbour's building, also to make and maintain everything necessary "for the protection of the adjoining building and the security of the adjoining occupier." Though he may have acted exactly in accordance with the award of the surveyors, he is not to be relieved "from any liability to which he would otherwise be subject in case of injury by his building operations to the adjoining owner." If the adjoining owner, within a month or two of the completion of the underpinning, chooses to lower his lowest floor also, the building owner cannot obtain from him any part of the expenses incurred. The "security of the occupier" is, of course, a novelty. It is not clear whether it is to include adequate protection against burglars—an effective guardianship of the premises—as well as security against split walls, shaky ceilings, and damage from falling materials. Such provisions solve questions about "right of support" by a short cut. This case may serve as an example of others, which have made some building owners, in depressed spirits, fancy themselves regarded by law-makers as a sort of criminals. I trust, however, that Hope will still spring eternal in their breasts.

In the article on the proposed Bill in your issue for the 20th ult. you mention that such words as "the utmost possible encouragement and the least possible hindrance to intelligent building" might well be put in the preamble. The creation of new buildings, giving improved accommodation on the same site, has been spoken well of. The owner of property adjoining an improving owner may not, for the moment, deem himself the most fortunate of mankind ; but very ample protection for him may be dearly purchased if enterprise is discouraged.

I intended to make, and support by brief argument, some suggestions tending to redress the balance to some extent, as I do not wish to see building regarded as a thing to be avoided. I will, however, merely ask for space for the suggestions themselves, and omit the arguments.

1. The task of communicating with his own lessees and occupiers should be thrown upon the adjoining "owner" when he has received the notice from the building owner. Some method should be devised for consolidating the opposition instead of every man fighting for his own hand.

2. The adjoining owner should be bound to give security when required, not only for the work done under his requisition (Sec. 79, clause 2), but also for all the work for which he will have to pay under the award. The building owner may be required (Sec. 79, clause 1) to give security for the payment of all costs and compensation. This alteration would make things even.

3. In all cases of defective party structures the surveyors should be able to award that the expense of protecting the premises of the adjoining owner (shoring, temporary partitions, &c.), should be shared, not borne wholly by the building owner, as proposed by Sec 75 (2) of the Bill.

4. The provisions of the 1844 Act (Sec. 24), or something similar, should be enacted, so that the position of the party structures can be settled by the award, and the surveyors empowered to award compensation (if any) "in view of the lessening of the building, or for such other injury (if any) as shall be occasioned" by the adjustment.

5. The surveyors should be able to let the building owner go to work quickly. It should not be absolutely necessary for him to be kept waiting till three months have expired (Sec. 75) (8.)

6. When a party structure is added to or raised the adjoining owner should pay a share when he uses more of it ; the contrary in Sec. 80 (2) (a) of the Bill.

7. If a building owner chooses to erect his own external wall, adjoining an old party wall, he should not be liable to pay charges in respect of the rebuilding of the old party wall, which he left standing—probably to oblige the adjoining owner by not laying his premises open (the contrary under Sec. 80 of the Bill).

8. Such an external wall should not be used as a party wall unless the adjoining owner pays his share for wall and land. If, however, the adjoining owner goes to the expense of rebuilding the party wall (as a complete wall without openings, &c.), then it might be fair that the other owner should be taken to have abandoned all claim to the land, on which that wall stands.

9. There should be a right to block up, at the expense of the person making them, openings in external walls abutting on other premises. This was provided for in Sec. 37 of the 1844 Act, but probably forgotten by the framers of the 1855 Act. Some such provision will be very advisable now that it is proposed that "a wall between two buildings differing in height shall be deemed to be a party wall [only] to a height of 10 ft. above the roof of the lower building" (Sec. 45 of the proposed Bill.)

This last provision (9) might protect either owner against the other, and would be fair all round ; and I venture to think that, although mainly in favour of the building owner, the other alterations I have suggested would also be fair, and that they should therefore find their places in any new Building Act for London.

F.R.I.B.A.

WHITEHAVEN UNION INFIRMARY COMPETITION.

SIR,—In addition to the eccentricities in the above-named competition, referred to by your correspondent, "Non-Competitor," of last week, there may be named also the facts that (1) No assessor will be appointed ; and (2) No plan or levels of the site are to be obtained. On application for these last, one is politely informed that one may survey the site for himself ; and take levels, too, I presume. Now Whitehaven is not a place that might be considered central, or even easily accessible, and how many scores of architects the Board of Guardians hope to induce to take the risk of a long journey and to do their work for them gratuitously, besides paying all expenses, no one out of the "cannie North" can tell ; but perhaps the information is withheld, not in

the interests of the ratepayers, but in those of local competitors. An architect may be excused for thinking that when he lays before a Board all his office-work on their schemes for nothing, he has done enough; and that he ought not to be asked to present them with plans and levels of their land in addition. But with such requirements as these, and the surreptitious guineas demanded in other cases, competitions are really not fit to think about, and the profession has fine opportunities to follow the advice so generously offered to it of late, namely, of practising its art without reference to the means of livelihood. So far as I am concerned I insist upon being PAID FOR MY WORK.

February 13, 1894.

The Student's Column.

THE STRUCTURE AND PHYSICAL PROPERTIES OF BUILDING STONES.—VII.

STRENGTH.

BY the strength of building stone we mean its relative capability, in practice, of withstanding compressive and other forces brought to bear upon it. This has attracted more notice, perhaps, than any other of the physical attributes of stone, but we have no space to deal with it at any great length, and it is doubtful whether the majority of the innumerable experiments carried out are sufficiently reliable to merit much notice. We may, however, give a brief *précis* of the essential features of the subject.

The quality of strength is regarded by most users of stone as of more importance than almost any other of its characteristics. If we did not know this from experience, the ubiquitous stone merchants' circulars, if we care to peruse them, continually remind us of it. There is a vague impression abroad, because the granites and other highly crystalline rocks require a greater weight to crush them than do the earthy limestones and sandstones, that a graduated scale exists in Nature between these extreme types of stone, and that the quality of an intermediate kind may be readily gauged from its relative position in that scale, as deduced from experiment. A more erroneous impression could not exist. Each class of stone must be regarded on its own merits, and viewed from other standpoints than its capacity to resist compression or tension. Of late years it has become pretty generally recognised, especially on the Continent and in America, that the practical value of "crushing strengths" has been enormously exaggerated. Apart from the indifferent manner in which experiments bearing on the subject have mostly been carried out, it is urged that the weakest stones dealt with show themselves capable of bearing a much greater crushing load than they are ever called upon to carry when built up—even in the largest edifices. Hence it is argued that their strength is only of secondary importance. And there is a great deal of truth in this.

Some, however, are still of opinion that tests are highly desirable, and their views of the matter are ably expounded by Professor Unwin, F.R.S. He remarks* that a block of stone at the base of a pier or in an arch ring is subject to a thrust due to the weight of the structure, and, as far as the condition can be secured, the thrust is normal to the faces of the block. "Generally, the pressure does not reach 10 tons per square foot; though in some lofty structures it reaches 20 to 30 tons, and possibly in some arch rings 40 or 50 tons per square foot. Now, the crushing resistance of stone, tested in small cubes, is seldom less than 250 tons, and often reaches 1,000 tons or more per square foot." (Many oolites, we may mention, never exhibit greater strength, however, than 130 tons per square foot.) The cubical form is a stronger one than that of the blocks used in buildings, and single blocks are stronger than aggregates. Further, it is quite impossible in any actual structure to secure a simple condition of crushing stress. "Settlement, imperfect bedding, unequal compressibility of different blocks, and other causes, introduce unforeseen and incalculable straining actions. Hence, the real factor of safety is not nearly as great as the nominal one"—all of which we thoroughly endorse. We may add that the difficulties of the case are further aggravated by the force of the unequal expansion due to variations in temperature as explained, in another connexion, in our last article; and also by the complications that arise immediately the material commences to decay.

* "The Testing of Materials of Construction," 1888, p. 412.

It seems to us that the argument is best judged in this case not from the laboratory, but from the known effects of pressure on the stone when used. He would be a bold man indeed who asserted that the key-stones of arches never give way from this circumstance. This may be, and no doubt mostly is, due to bad cutting in the mason's hands, or bad building; but that is just what has to be contended with—the stone should be strong enough not to feel it. Who could pass under Holborn Viaduct and attentively regard the massive granite pillars on which it is supported, and then tell us that stone—even a best-quality granite—is always strong enough to bear the stresses called into play, in practice? We do not find fault with this particular granite, quite the contrary; we make no complaints as to the foundations; nor inquire whether any settlement has taken place; or whether the pillars were cut truly; or were badly constructed or designed; or were cracked during transit from the quarries. All we desire now is to emphasise the fact that owing to some circumstance the stone has cracked in certain places, that it was not strong enough to deal with the simple or complicated stresses to which it has evidently been subjected from some cause or another. Many other instances might be quoted. In short, it is useless to argue that the knowledge of the strength of a stone is not of some value for building purposes. Certain oolites have a "crushing strength" of only 60 tons per square foot, and this is perilously near the stress to which they might possibly be subjected in large buildings.

As Professor Hudson Beare pertinently remarks,* engineers, who would never dream of employing iron and steel without careful tests, accept large quantities of stone without any form of test, trusting merely to a casual examination. Although stone is not subject to the imperfections and carelessness of manufacturing processes, still, like all natural substances, it varies greatly in quality, and hence the need of tests is just as great as in the case of manufactured articles.

That is very true; but are the methods at present adopted in experimenting on the strength of stone capable of giving us its true compressive resistance? Are not the results obtained on one and the same material, aye, on cubes cut from the same block, often so widely divergent as to incur a slight suspicion that, after all, the experiments are of but little practical use? Let us consider the results arrived at by Professor Beare, which we select as being recent, and as having been carried out with scientific precision, with first-class machinery and appliances. We have constructed the following table from data derived from this source, which shows at a glance the enormous variation in strength of some prominent British building stones:—

Table showing variation in strength of building stones:—

Class of Stone.	Name of Quarry, or Stone.	Crushing load on cubes per sq. ft. in tons.		Difference in tons.
		Lowest result.	Highest result.	
Sandstones.	Prudham (Four stones quarry)	393·8	517·3	123·5
	Corncockle	264·7	487·3	222·6
	Cragg	388·7	710·5	321·8
	Corsehill	341·6	579·6	238·0
	White Grinshill	171·5	245·9	74·4
	Hercules Ridge	286·6	397·1	110·5
	Lightcliffe (bed 3)	960·2	1,090·0	129·8
Dolomites.	White Mansfield	395·5	546·0	150·5
	Yellow Limestone	383·7	703·8	320·1
	Anston	281·7	327·1	45·4
Oolites.	Ancaster	492·8	626·4	133·6
	Portland (Base Bed)	240·6	324·4	83·8
	Ketton	70·5	128·4	57·9
	Corsham Down (Bath Stone)	70·1	128·6	58·5
	Farleigh Down ,,	58·1	69·3	11·2
	Box Ground ,,	81·9	126·1	44·2
	Stoke ,, ,,	70·4	106·7	36·3
	Westwood Ground ,,	89·7	140·4	50·7
Granites	Dyce (Aberdeen)	908·4	1,253·0	344·6
	Sclattie ,,	651·2	978·0	326·8
	Ben Cruachan	766·8	1,008·0	241·2
	Corrennie	1,098·0	1,417·0	319·0

The author, referring to the whole of his tables, from which the above form a large selection says—"It will be seen that the figures for crushing loads are very closely concordant." We are sorry to have to dissent from this view, they seem to us to point to an exactly opposite conclusion; but we are quite willing to leave the matter with the reader—the figures speak for themselves.

* "Min. Proc. Inst. C.E." vol. cvii. (1892) p. 357.

One thing we have never been able to understand in reference to the method of recording the crushing strength of building stones, is the practice of stating the *mean* strength of several samples, instead of the lowest. We rely on the principle embodied in the dictum that "the strength of a chain is the strength only of its weakest link." Still more are we at a loss to comprehend the practical value of lumping together a number of stones of the same class, but from different quarries and districts, and calculating the mean strength of the whole. Thus, we learn with reference to the crushing experiments just alluded to (which, however, are by no means isolated in this respect) that the granites showed a mean strength of 1112·2 tons per square foot; oolites 141·3 tons; sandstones 489·8 tons; and dolomites 500·5 tons. Such figures can have no practical value for reasons that are very obvious when they are compared with those in the above table. We notice, for instance, that sandstones vary from 171·5 tons to 1,090 tons per square foot; dolomites from 281·7 to 703·8 tons; oolites from 58·1 tons to 626·4 tons, and granites from 651·2 tons to 1417 tons. The range of variation in the same stone, as we plainly see, is in some instances more than two-thirds the strength of the lowest result, and great differences are, in almost every case noted, very apparent; to strike a "mean strength" under such circumstances can be of no use whatever to the architect or engineer.

Another thing to which we take exception is the testing of very small (2 in. to 4 in.) cubes of stone and calculating from the results the crushing strength per square (or cubic) foot. General Gillmore found* that within certain limits "the compressive resistance of cubes per square inch of surface under pressure increases in the ratio of the cube roots of the sides of the respective cubes expressed in inches." From this it naturally follows, as Mr. Merrill has remarked, that ambitious dealers desiring any stone to show great power of resistance would select the larger-sized cubes to be experimented upon. It would appear, however, that the law above given does not hold good for blocks of large size, such as are used in actual building.† We very much doubt whether any set formula, even when drawn up by such a careful observer as Professor Bauschinger, or Dr. Böhme, is capable of being applied to estimating proportional increase in compressive resistance from small cubes to large. There are so many uncertain elements in the way. Where a 2-in. cube has been experimented with it may be that the resistance was controlled by large shells. To anticipate a little, we have discovered, by means of the microscope that nearly all non-crystalline stones have a species of concretionary structure set up in them, which is not apparent to the naked eye. The concretionary portions are naturally stronger than the normal stone, and they are fairly close together in certain varieties. Chance has hitherto determined whether cubes of normal, or of concretionary stone have been experimented with. A large block of stone might develop (and often does) minute cracks that weaken it very materially; these would not be apparent on a carefully-selected 2-in. cube.

It has often been remarked, and has been shown experimentally, that the shape of the piece of stone to be tested is also a controlling factor in regard to its strength. As a rule, cubes are selected for this purpose, though we know that stones of this shape are not very frequently used in actual construction; here, again, is an unknown quantity. A number of formulæ of more or less value have, however, been drawn up to enable us to arrive at approximate conclusions. It may be useful to record the following:—

1. The strength of geometrically similar test pieces varies as the square of homologous sides.‡

2. The variation of the crushing strength of prisms with the form of the cross-section has been determined by Rondelet; with prisms of circular, square, and triangular bases of equal area, the strengths were proportional to 1 : 0·93 : 0·86; and for prisms on a square base, and rectangular base, with sides as 1 : 2 of equal area, the strengths were as 1 : 0·95. As Professor Unwin remarks, these numbers are nearly in the reciprocal ratio of the square roots of the circumferences.

3. When cubes are used for columns, placed on each other, the strength diminishes with the number of cubes.

4. A single block is always stronger than a

* "Annual Report of Chief of Engineers" (United States). 1875.

† Gillmore, "Notes on the Compressive Resistance of Freestone," &c. (1888), pp. 20-29.

‡ Unwin, *Op. cit.*, p. 422.

compound one of the same form made of separate blocks without cement.

We cannot dismiss this subject without referring to other grave errors introduced in results of experiments in crushing building stone by one or some of the following :—

a. Crushing the stone before all the quarry-water has dried out.

b. Not experimenting with perfect cubes, and using sheets of lead, pine, &c., between the dies of the machine to "distribute the pressure," whereby the real strength of the stone is greatly diminished.

c. Crushing abnormal specimens, or samples sent to be operated upon by pecuniarily interested parties.

A series of experiments showing the strength of stone when saturated with water is highly desirable. From the nature of things we know that building-stone is hardly ever quite dry, whilst it is frequently soaked with water, or exposed in damp situations. The absorption of water must materially alter its relative strength in many instances.

The foregoing observations are sufficient, we think, to show the great difficulty in estimating the strength of stone, under certain conditions, in the building, and also in the laboratory. For our own part we have discovered a mathematical process of ascertaining the strength of stones from the relative ratio of their capacity for absorbing water. The close connexion between "strength" and "absorption" we have pointed out on a former occasion, but the whole is dependent on structure, and we therefore prefer to reserve demonstration of this until the end of the series, when the student will understand more about the structure of building-stone.

GENERAL BUILDING NEWS.

ALTERATIONS TO BREWERY, DERBY.—The Derby Brewery, Nottingham-road, Derby, is to be further altered, and a new chimney-stack erected from the plans of the company's architect, Mr. R. E. Carpenter, of Burton-on-Trent, the builders being Messrs. Oldershaw, of Chaddesden.

PROPOSED NEW CHURCH, ABERDEEN.—It is proposed to erect a new parish church in the district of Kittybrewster, Aberdeen. Only the main body of the church, or nave, will be built at first, at a cost of 2,500*l.*, and to accommodate 500 worshippers; but it is hoped soon to complete the design at an expenditure of 5,000*l.*, and provide 800 sittings. The material used in the construction will be light grey granite. The architect is Mr. A. Marshall Mackenzie, Aberdeen.

INTERMEDIATE SCHOOL, PORTH, GLAMORGAN.—The memorial stone of the Porth Intermediate School was laid on the 5th inst. by Mrs. L. E. Picton-Turbervill. The school, which is one of thirteen to be established throughout the county, under the provisions of the Welsh Intermediate Education Act, will provide accommodation for over 100 boys and 80 girls, and the estimated cost is 4,675*l.* The architect of the school is Mr. Jacob Rees, Pentre, and the contract has been placed in the hands of Messrs. Charles Jenkins & Sons, Porth.

WESLEYAN SCHOOLS, NORTH SHIELDS.—New Wesleyan Sunday Schools have just been opened in connexion with the Wesleyan Memorial Church, Albion-road, North Shields. The new buildings consist of a lecture-hall 51 ft. by 30 ft., with class-rooms, each 17 ft. by 16 ft., at the platform-end of the hall; with an infant-school behind the platform 24 ft. by 19 ft.—affording accommodation in classes for 354 children. The class-rooms have sliding partitions. In addition to these ground floor rooms, on the first floor are other rooms. The building is connected with the Memorial Church by a covered corridor. This will form the main entrance from Albion-street to the lecture-hall for the boys, while a second entrance from the new street in the east side gives a separate entrance intended to be used by the girls and infants. In addition to these buildings there is provided a residence for the caretaker. The lecture-hall, &c., is heated by hot water, the boiler for which is placed in the basement. Externally the buildings are made to be in accord with the church, and the walling in stone is similar. The lecture-hall presents a gable to the south, with two three-light trefoiled windows in the lower part separated by a buttress. In the upper part of the gable is a large circular window. The east elevation presents a double gable to Drummond-terrace, with a moulded arched headed doorway on ground floor, with necessary windows to the various apartments. Internally the lecture-hall has an open collar-beam roof with wrought-iron principals. Honeyman's patent roof ventilators have been used. The buildings have been erected by Mr. T. W. Weir, of Howdon, the local sub-contractors being Messrs. Addison & Sons for slating, Mr. Heslop for plumbing, Messrs. Dinning & Cooke, of Newcastle for heating engineers' work, and Mr. Steel for smith's work. Mr. F. R. N. Haswell, F.R.I.B.A., (from whose designs the church was built) is the architect.

MIDLAND RAILWAY INSTITUTE, DERBY.—A new Midland Railway Institute has just been built at Derby from the designs of Mr. C. Trubshaw, the Company's Architect. It is a two-story building of red brick with terra-cotta panels and string-courses. The entrance-hall, 17 ft. 6 in. wide and about 40 ft. long, is entered through iron frontage gates and swing doors. On the right is the newspaper room, 44 ft. by 40 ft. Leading from the newspaper room is the magazine room, about 20 ft. by 20 ft., and from this apartment access is gained to a chess or class-room. There are also a coffee-room, a small kitchen, larder, and other offices. To the left of the entrance-hall is the library, 26 ft. long by 35 ft., and a committee room. There are two staircases leading to the rooms above, one from the front hall, the other from the back. The latter leads to the stage of the concert-hall and the dressing-rooms at the back. Immediately on the top of the front staircase is a class-room, and on the left-hand side is the concert or lecture hall. This hall is capable of seating upwards of 500 people, being 45 ft. by 67 ft., and is provided with proscenium and stage. The billiard-room to the right is 49 ft. by 27 ft. The electric light has been used all through the building. The contractor for the new Institute is Mr. W. Dickinson, builder, Ashbourne-road, and Mr. C. Smith is the clerk of works.

ST. STEPHEN'S SCHOOLS, WOODVILLE, NEAR BURTON-ON-TRENT. — These schools are to be altered and enlarged from plans by Mr. R. E. Carpenter, of Burton, as approved by the Education Department.

SANITARY AND ENGINEERING NEWS.

EXTENSION OF CORPORATION WATERWORKS, ABERDEEN.—Work has been provided at Cattofield for men otherwise unemployed, in making the excavations for a new concrete service reservoir, of oblong shape, 265 ft. long, 130 ft. wide, and 12 ft. deep. This new reservoir is intended to give a better supply to the higher-lying districts round Kittybrewster, and also to the lower reaches of Woodside and to the whole of Old Aberdeen. This arrangement will reduce the present strain on the mid-service reservoir at Slopefield, as the new reservoir will be supplied from the low-service reservoir at Mannofield by a 24-in. cast-iron contour main, which is at present being laid by the Corporation's water staff. This main will be 3½ miles in length, and will supply certain other districts *en route*. The pipes alone will cost 11,000*l.*, the contractors being Messrs. Macfarlane, Strang, & Co., Lochburn Ironworks, Glasgow; and the total cost of the section of the works mentioned will be 25,000*l.* The other works authorised by the Local Act of Parliament passed last year are (1) an additional circular storage reservoir at Invercannie, 650 ft. in diameter, with a water depth of 14 ft. 6 in., to hold 30,000,000 gallons, giving with the existing reservoir a total storage equal to about five days' supply in place of thirty hours as at present; (2) six additional filter-beds to filter one million gallons each daily, which, with the existing filter-beds, would filter the whole supply to the town, and permit of one filter-bed being off work, so that the beds can be cleaned regularly in rotation; (3) at the villages of Braemar, Ballater, Aboyne, and Kincardine O'Neil above the intake the levelling and laying-out of irrigation farms, with all the necessary concrete channels, sluices, &c., for carrying and distributing the sewage to the different parts of the land, these last-mentioned works being designed to prevent as far as possible the pollution of the Dee, and consequently of the Aberdeen water supply. Mr. William Dyack, Burgh Surveyor, Aberdeen, is resident engineer for all of the above works, and Mr. James Gale, of the Glasgow Corporation Waterworks, has acted as consulting engineer. Over and above the cost of the Cattofield reservoir specified above, the expense of the waterworks extension works described is estimated at 60,000*l.*

DRAINAGE WORKS, NORTHAM, DEVON.—For the new sewer for the drainage of Orchard Hill, Northam, Messrs. G. Shellabear & Son, Plymouth, are the contractors, at a price of 2,560*l.* The works have been designed, says the *Western Morning News*, by Mr. Baldwin Latham. The sewer commences at Raleigh Gate, and discharges at Lower Cleave houses, the length being one mile. The stoneware pipes, of 10-inch and 12-inch diameter, and of extra thickness, run into a tank sewer, at Cleave houses, of 4 ft. 6 in. diameter, 100 yards length, and 30,000 gallons capacity, and constructed of brick (on the inside) and concrete. The discharge takes place through 1,380 feet of 12-inch iron pipe, which will be covered at low water. Between the tank sewer and the iron pipe are situated the tidal flap and penstock chambers. Two automatic flushing tanks, each of 650 gallons capacity, will be placed at the beginning of the drain and the entrance to Chanter's-lane respectively. The sewer will be perfectly straight from manhole to manhole. All turns take place in the manholes, and the floors of the latter have the same form as the pipe, so as to avoid accumulations. The surface boxes of the manholes will be air-tight, and ventilation will be carried out by means of six ornamental iron columns, 30 ft. high. The sewer will be laid at a depth of between 7 ft. and 20 ft. The resident engineer for the works is M. A. J. Jenkins, and the contractors' representative is Mr. H. B. Neal.

FOREIGN AND COLONIAL.

FRANCE.—In accordance with a Parliamentary vote, the Minister of Fine Arts has just opened a competition for three architects' appointments in connexion with the Département des Monuments Historiques. The "projets" of the competitors, twenty in number, are at present exhibited in the Museum of Comparative Sculpture at the Trocadéro. The architects were left free to select, from among the civil, military, or religious buildings from the eleventh to the sixteenth century, the monument of which they wished to represent the actual state and a restoration. The works exhibited show for the most part a high average of learning and talent. We may mention especially the drawings submitted by M. Lucien Roy ("Eglise de la Chapelle" at Crécy), M. Benouville (St. Julien le Pauvre, which he proposes to transform into a museum of specimens of stone), MM. Nodet, Marcel, Balleyguier, Bonnaye, and Babet. In addition to this competition of drawings, the competitors have also to pass an oral examination in history and archæology.——Seventy-two architects have taken part in the competition for a new Hôtel de Ville for Ivry-sur-Seine. The designs are exhibited in the Palais des Arts Libéraux, at the Champ de Mars. Many of them are splendidly drawn, but the majority have the fault of being too pompous and pretentious, and at variance with the simplicity which is more suitable to a suburban town hall.——At the École des Beaux-Arts the "Prix Labarre" has been awarded to M. Blondel. The prize is given to the student of the first or second year who produces in three days the best sketch of a given subject. The "Prix Fortin" has been awarded to M. Rouault.——We may notice in passing the picture exhibition organised in Rue Buonaparte by the editing staff of the journal entitled "La Plume," and that of the landscape-painters MM. Schuller and Ricard-Cordingley in Rue St. Lazare. ——The eminent sculptor Cavelier, whose death we mentioned recently, has left two *rentes* of 1,500 francs each, one to the Société des Artistes Française, the other to the "Société des Artistes-Peintres, Sculpteurs, Architectes et Graveurs," founded by Baron Taylor.——The decoration of the new École de Pharmacie will be shortly completed by four large panel pictures to be executed by M. Besnard.—— The Sèvres manufactory is still at work at a dessert-service which is to be offered as a wedding present to the Duke and Duchess of York. It will consist of two jardinières, four large fruit baskets, and forty plates. —— M. Mercié will exhibit at the next Salon the monument which is to be erected at Domrémy in memory of Joan of Arc. The sculptor has much modified his first sketch; the monument now represents the heroine in the act of leaving her father's house to undertake the liberation of France. She is led by "Le Génie de la Patrie," who puts a sword in her hand, and indicates with a gesture the road she is to take. This group will be erected on a pedestal in front of Joan of Arc's house. The inauguration will not take place, however, for two years.——M. Bonnat is to represent the committee of the Société les Artistes Francais, at the Fine Arts Exhibition at Vienna. M. Ernest Barrias has been appointed vice-President of the same society, in place of the late M. Cavelier. —— The municipality of Kléber, in Algeria, intend to raise in this small town a monument to General Kléber.——M. Antony Jolly, architect, a former pupil of the Ecole des Beaux-Arts, has been appointed architect to the French residencies at Madagascar. ——Experiments are being commenced at Nice for the disinfection of sewage by electrolysed sea-water, on the system of the engineer, Hermitte.——The railway company "de l'Ouest" has commenced the construction of a new station at Montretout, near St. Cloud.——The "Conseil Supérieur des Prisons" has expressed itself in favour of the suppression of the prisons of Mazas, Grande Roquette, and Saint Pélagie, and of replacing them by the establishment of the single penitentiary which is to be constructed in the department of the Seine-et-Marne, and will be capable of containing 1,800 prisoners.

NORWAY.—Herr Henrik Bull, architect of the new National Theatre now in course of construction in Christiania, a "model" structure, has given a lecture on the scheme at the Polytechnic Society there. The auditorium and stage will be located in two buildings, absolutely separated, except for a necessary door in the basement and one on the first floor, both fireproof, and for the scenarium, but which may be completely closed with an iron curtain. The main entrance will be through a portal in University-street. This leads to a vestibule, in which are the doors and staircases of the stalls, the pit, and the *loges*. At the close of the performance special doors from the lower parts opening directly on the street will be thrown open. The Royal box will have a separate entrance, vestibule, and *foyer*. On the second floor is the first tier of boxes, with the principal *foyer* or lounge situated over the roomy vestibule. To the third floor—second row of boxes—the *foyer* is continued from the second floor, and outside are balconies whence iron ladders lead down into the street. On the fourth floor is the gallery, whence there are also iron fire-escapes. The basement is set apart for the orchestra, and has a separate entrance. The stage-building—*i.e.*, the structure at the back—is reached through two entrances from another street, in the basement of

which there are rooms for the officials, performers, &c. Around the stage runs a corridor, in which are the dressing-rooms, wardrobes, &c. There is also a *foyer* for the use of the actors and for rehearsals. The stage rises right through the entire building to the dome. Above the first-floor corridor is another floor, with dressing-rooms, and a sitting-room for the choristers. On the third floor, at the back, is the curtain storage, the tailors' workshops, and a large painters' studio. In the loft is the carpenters' shop. At the back of the stage is a special exit, approached by sloping terraces, so large that a fire-engine, all complete, may drive through it right on to the stage. In fact, no precaution has been omitted in order to ensure exemption and safety from fire, the stringent regulations now in force in Prussia and Austria as regards theatres having been strictly observed. Gas is not used in any part of the buildings, only the electric light, but in the corridors and on staircases, &c., there are oil lamps and candles in reserve. The lower part of the structure is to be faced with polished granite from the Idefjord, whilst the columns in the interior will be executed in polished Norwegian marble. The structure rests on 3,400 piles, ten yards in length, encased in concrete one yard in thickness. The entire surface is covered with concrete laid by the Christiania Cement Factory.——An association of workmen has been formed in Christiania for the erection, on co-operative principles, of two-storied detached workmen's dwellings with a plot of garden attached 500 square mètres in area. The dwellings are first to be let to the occupier, but upon his having paid up half the value a lease will be issued to him. It is not intended to build regular workmen's quarters, but to spread the dwellings all over the town. The principles of the association have been adopted from Germany.

SWEDEN.—It has been decided to postpone the holding of the projected Scandinavian Industrial Exhibition in Stockholm from 1896 to 1897, as in the former year similar exhibitions will be held in Berlin and Brussels, and because in the latter year occurs the twenty-fifth anniversary of the reign of King Oscar. A Scandinavian Industrial Exhibition will, however, be held in Malmö in 1896.——The Stockholm Building Board has just arrived at a decision which has caused some comment in building circles, *i.e.*, having refused a building contractor a license for business on the grounds that he has only recently passed through bankruptcy. The Board maintains that such a person is not in a financial position to contract for materials, &c., hence the refusal. In a recent case, it is pointed out, the vendors of building materials only received 1 per cent. of their claims.

DENMARK.—A recent number of the *Ingeniör* contains designs and plans, with description, of the new Town Hall in Copenhagen, on which work has commenced. It is the greatest undertaking of its kind commenced in the Danish capital during the present century. The building will be centrally situated, surrounded by boulevards, on the site of the last Industrial Exhibition. The design chosen, in the main, is one of three sent in by Herr M. Nyrop, the architect. The Town Hall will consist of front, central, and rear blocks, with a clock-tower. In course of time a square, with terraces, statues, &c., will be planned in front of the hall in order to make its appearance more imposing. The building will be built of red bricks, resting on a plinth of Bornholm granite, 8 ft. in height. The cost of the building, with installations of steam, ventilation, sewage, electricity, &c., is estimated at about 200,000*l.*, but it is generally believed that the sum will be exceeded.——The new Museum of Industries in Copenhagen is now completed externally, and the scaffoldings have been removed.——Work on the Glyptotek—an art gallery presented to the city by a brewer, Herr Jacobsen—is now progressing rapidly. The façade is to be decorated with six colossal allegorical groups in bronze, three on each side of the entrance.

MISCELLANEOUS.

OPEN SPACES.—At a recent meeting of the Court of Common Council a memorial was received from ratepayers, commoners, and inhabitants of Banstead, Surrey, asking for assistance in the proposed preservation of Banstead Commons—see our "Note" of January 28 last year. The petitioners represent that a former attempt to enclose the land had been successfully resisted, though at a cost to them of about 4,000*l.* for legal expenses, towards which the Corporation gave 1,000*l.* The inhabitants, however, have been obliged to resort again to litigation, spending 1,300*l.* in securing the assent of Parliament to a scheme by the Board of Agriculture for appointing conservators. Of the later charges Mr. Bonsor, M.P., has defrayed 500*l.*, and Mr. Baring 250*l.*; the memorialists petition the Court to help them in meeting a deficit that still remains of 600*l.* On Monday, the 5th proxo., will be held a meeting of owners and occupiers of houses fronting upon Red Lion-square, High Holborn, to consider a resolution for empowering the trustees to transfer as a gift — under the Metropolitan Open Spaces Act 1881—to the London County Council all their interest and duties of management in respect of the square-garden, with a view to its permanent preservation for public enjoyment. The garden, 1½ acre in extent, was laid out by the Metropolitan Public Gardens Association at a cost of 250*l.*, leased to trustees, and opened on August 10, 1885. A project is started to buy for 6,400*l.* an open space of about 8 acres at Manor-lane, Lee. The above-cited Association have obtained the consent of the respective rectors to the laying out of the churchyards of St. Mary, Bow, and All Hallows, London Wall; and have arranged with the owner of Iron-square, Hackney-road, for a forty years' lease, at a peppercorn rental, of the garden, and its use by the public. The Lewisham Board of Works have voted 2,800*l.* towards the purchase of Brockley Hilly Fields, so now the total cost of 43,300*l.* (to which the London County Council give 22,000*l.*) for the 45 acres is assured. See "Notes" in the *Builder* of March 5, July 16, and November 12, 1892, and October 28 last, for history of the movement for purchase.

EXHIBITION OF METEOROLOGICAL INSTRUMENTS.—The Council of the Royal Meteorological Society have arranged to hold at 25, Great George-street, S.W. (by permission of the President and Council of the Institution of Civil Engineers), from April 10 to 20, an exhibition of instruments, photographs, and drawings relating to the representation and measurement of clouds. The committee will also be glad to show any new meteorological instruments or apparatus invented or first constructed since the exhibition in 1892, as well as photographs and drawings possessing meteorological interest.

ILLEGIBLE SIGNATURES.—We have had to leave unanswered two or three letters during the last week, through the writers' signatures being illegible. Correspondents ought to remember that though the context will generally explain a badly-written word in the body of a letter, there is no such explanation for a badly-written signature. Nothing can be more stupid and unbusinesslike than to write to a person to whom your name is not known, with a signature which is either illegible or which may be read three or four different ways.

ROCHDALE BUILDING TRADES FEDERATION.—Mr. W. Mallinson, Secretary to the Rochdale and District Building Trades Federation, has just drawn up his report on the first year's working of that organisation. The report states that one of the most important subjects that has engaged the attention of the Federation has been the fair contract clause. The first public body they approached on this question was the School Board, where Councillor Rushworth at their request moved for the insertion of a fair contract clause in all contracts for work to be done for the School Board. Although the motion found no seconder, the Federation consider it was a useful means of introducing the subject to the notice of the public. Councillor Rushworth also undertook to move a similar resolution at the October meeting of the Town Council. A long discussion ensued, but the resolution was rejected by 18 votes against 15. The Federation consider that many of the arguments used against the resolution had no bearing on the question, and they believe that when the motion is again introduced in the Council the voting will be reversed. In reply to a communication sent to the Pioneers' Society, the Federation learned that "all contract work let by the committee of the Pioneers is given to men who pay the standard rate of wages." They consider this rather an evasive reply from a co-operative society, as no opinion is expressed on sub-letting. The Provident Co-operative Society, in response to a request of the Federation, adopted a resolution admitting the principle of the fair contract clause, with the standard rate of wages, and no sub-letting where avoidable. To secure if possible a clause in the Town Council building regulations preventing jerry-building, the Federation sought to approach the Building Committee, and were informed that when the time arrived a deputation would be gladly received and heard. Mr. Mallinson's report concludes, "There is every promise of the building trade being busy. Last year found us fairly well employed, despite the prognostications of our employers. . . . . We trust that our brethren in the surrounding district who receive a lower rate of wages than ours will adopt means to bring their wages up to our level. . . . . At present the Federation is in its infancy, and before we reach its full effect as a principle we shall have to gain experience, and to show a broader spirit of brotherhood. This spirit is discernible in our unions, and with that and an earnest will, difficult problems of organisation will not be incapable of solution."

CAPITAL AND LABOUR.

BUILDERS' LOCK-OUT AT NEWCASTLE.—The dispute between the Newcastle Master Builders' Association and the plasterers and bricklayers culminated on Monday in a lock-out, and through the last two societies being federated with the joiners, plumbers, lathrenders, and labourers, these bodies of men are also stopped from continuing their employment. The dispute arose because the plasterers wished to compel a foreman to join their society, and the bricklayers to make a mason cease working as a bricklayer, and further to make the offending employer in the last-named case pay 5*l.* The Employers' Association have taken joint action, and thus ordered a general lock-out.

MEETINGS.

FRIDAY, FEBRUARY 16.

Architectural Association.—Mr. J. L. Robinson on "The Last Three A. A. Excursions." Illustrated. 7.30 p.m.

Sanitary Institute (Lectures and Demonstrations for Sanitary Officers).—Professor W. H. Corfield, M.A. on "Sanitary Appliances." 8 p.m.

Institution of Civil Engineers (Students' Meeting).—Mr. Walter Beer on "Ship Slipways, having special reference to the Dover Slipway." 7.30 p.m.

Painters' Hall.—Mr. W. Fourniss on "The Processes of House Painting." III. 8 p.m.

SATURDAY, FEBRUARY 17.

Sanitary Institute (Lectures and Demonstrations for Sanitary Officers).—Visit to Croydon Water-works and Beddington Sewage Farm, Croydon. 2 p.m.

Royal Institution.—Lord Rayleigh, M.A., on "Light; with Special Reference to the Optical Discoveries of Newton." II. 3 p.m.

Queen's College, Cork.—Mr. Arthur Hill on the "History of Architecture." VI. 3 p.m.

MONDAY, FEBRUARY 19.

Surveyors' Institution.—Adjourned Discussion on Mr H. Blackbourn's paper on the "London Streets and Buildings Bill, 1894." 8 p.m.

Society of Arts (Cantor Lectures).—Mr. Hugh Stannus on "The Decorative Treatment of Artificial Foliage." I 8 p.m.

Victoria Institute.—8 p.m.

Liverpool Architectural Society.—Paper by Mr. J. W. Blakey entitled "A Few Notes on Quantities and Specifications." 6.30 p.m.

Leeds and Yorkshire Architectural Society.—Paper by Mr. D. B. Niven. 7.30 p.m.

TUESDAY, FEBRUARY 20.

Institution of Civil Engineers.—Mr. Ralph Hart Tweddell on "Forging by Hydraulic Pressure." 8 p.m.

Society of Arts (Foreign and Colonial Section).—Mr. Edouard Sève on "The Arts and Industries of Belgium and the Antwerp Exhibition, 1894." 8 p.m.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. J. Wright Clarke on "Details of Plumbers' Work. 8 p.m.

Royal Victoria Hall, Waterloo Bridge-road.—Mr. J Wolfe Barry on "The Tower Bridge." 8 p.m.

Glasgow Architectural Association.—Mr. George Walton on "Interior Decoration." 8 p.m.

WEDNESDAY, FEBRUARY 21.

Carpenters' Company (Free Lectures on Matters Connected with Building).—Professor Unwin, F.R.S., on "Niagara and the Work for its Utilisation." 8 p.m.

British Archæological Association.—(1) Mr. Chas. R. B. Barrett on "Riding Skimmington and Riding the Stang"; (2) Dr. A. C. Fryer on "Stained Glass at Lambourn, Berks." 8 p.m.

Society of Arts.—Mr. W. H. Preece, C.B., F.R.S., on "Electric Signalling without Wires." 8 p.m.

Sanitary Institute (Lectures and Demonstrations for Sanitary Officers).—Visit of Inspection in the Parish of Chelsea. 2 p.m.

St. Paul's Ecclesiological Society.—Paper by Dr. J. Wickham Legg, F.S.A. 7.30 p.m.

Builders' Foremen and Clerks of Works' Institution.—8.30 p.m.

Royal Meteorological Society.—Three Papers to be read. 8 p.m.

THURSDAY, FEBRUARY 22.

Institution of Electrical Engineers.—(1) Mr. Gisbert Kapp on "A Method of Testing the Magnetic Qualities of Iron"; (2) Mr. W. M. Mordey on "A Parallel Working through Long Lines." 8 p.m.

Society of Antiquaries.—8.30 p.m.

FRIDAY, FEBRUARY 23.

Sanitary Institute (Lectures for Sanitary Officers).—Mr. W. C. Tyndale on "House Drainage." 8 p.m.

Institution of Civil Engineers.—Students' Visit to the Paper Mills of Messrs. Joynson & Son, at St. Mary Cray, at 2 p.m.

SATURDAY, FEBRUARY 24.

Royal Institution.—Lord Rayleigh, M.A., on "Light, with Special Reference to the Optical Discoveries of Newton." III. 3 p.m.

Edinburgh Architectural Association.—Visit to Craighouse.

Queen's College, Cork.—Mr. Arthur Hill on "The History of Architecture." VII. 3 p.m.

RECENT PATENTS:

ABSTRACTS OF SPECIFICATIONS.

4,560.—VENTILATORS: *G. J. Chapman.*—In order to permit of air entering in gentle currents only, and to prevent draughts, ventilators are, according to this invention, provided with balanced or spring-controlled valves, which effectually control the passage of air in the ventilator.

4,737.—ARTIFICIAL MARBLE: *L. Nathan.*—According to this patent, the slabs or panels of marble to be imitated are made as they are fixed, so as to obviate the trouble of dowelling or fastening to the surface of walls or ceilings by plaster. The "marble" is made in a somewhat similar way to that ordinarily employed, but the facing is prepared on a removable surface and other details are introduced into the process in order to enable the material to be dealt with after it is in position.

4,788.—FLUSHING CLOSETS: *H. W. McClellan.*—A pipe with nozzle is, according to this invention, fixed above the pan or receptacle, and an air-pipe connects the discharge-pipe with the service-pipe, so as to ensure complete flushing with the greatest economy of water.

14,456.—WINDOW SASHES AND FRAMES: *G. Clark.*—To allow the sashes to revolve for cleaning and repairing, the pocket-pieces in the sash-frame are made to draw out, and longer than the height of the sash, enabling the sash to slide sideways into the pocket-hole. The lines are fixed to the centre of the sash styles with small metal plates. The sashes clearing the beads in the frame are easily and conveniently reversed.

17,142.—ARTIFICIAL STONE, PAINT, &C.: *L. Grote.*—Artificial stone, preservative paint, and such like manufactures are made by means of new combinations, "slag wool," gravel, clay, and many other materials being used.

17,766.—WINDOW FRAMES: *M. Rendell.*—To facilitate the removal of the window-sashes, one of the beads in each window frame is hinged so as to enable the bead to be drawn out, fixing the window sash. If desired, the hinged bead may be secured by a bolt, clip, or fastener.

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITIONS.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered.
*School Buildings	Lowestoft Sch. Bd. ..	10l. 10s. 5l. 5s.	Mar. 21
*Extension of Market and New Hotel	Lancaster Corp.	75l. 25l. ..	May 1
*School Buildings	Scarborough Sch. Bd.	.....	No date

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
*Supply of Materials	Hendon Local Board..	S. S. Grimley	Feb. 19
*Cleansing, Keeping in Repair, &c. Southwark Bridge	Bridge House Estate..	*Official*	do.
Additional Wards at Workhouse, Clayton	North Brierley Union	Jno. Drake	Feb. 20
Sewerage Works, Carlisle-road	Eastbourne Twn Coun.	R. M. Gloyne	do.
Paving Waldeck-road, &c.	Luton Town Council..	T. R. Roscoe	do.
Deepening Artesian Well	Selby Local Board	W. Curry	do.
Wesleyan Chapel, Pegswood Colliery, Morpeth	Jas. Humphrey	.....	do.
Street Works, Palmerston-road, &c.	Croydon Town Council	*Official*	do.
Additions, &c. to Model Lodging House, East Russell-street	Glasgow Impt. Trus.	do.	Feb. 21
School Work	Stoke-upon-Trent Union	do.	do.
Granite Road Metal	Loughborough District Highway Board	do.	do.
Additions to Premises, Broad-row, Great Yarmouth	W. P. Carrier	C. G. Baker	do.
Additions to House, Salterhebble, near Halifax	.....	A. G. Dalzell	do.
Pipe Sewer, Tanks, &c.	St. Asaph U.R.S.A. ..	Geo. Bell	do.
*Underground Urinal, Mile End-road	Mile End Old Town Vestry	J. M. Knight	do.
Street Works (two contracts)	Cardiff Town Council	W. Harpur	do.
School Buildings, Tunstall, Staffs.	Wolstanton School Bd.	A. R. Wood	do.
Two Roads and Twelve Cottages, Dynas Powis, near Cardiff	.....	W. H. D. Caple	do.
*Mansion, Stables, &c.	Capper Estate, Walthamstow	W. A. Burr	Feb. 22
Eleven Dwelling-houses, Yews, Lockwood, near Huddersfield	.....	J. Berry	do.
School Buildings, Frizington, Cumberland	.....	W. G. Scott	do.
Materials	Birmingham Corp.	W. S. Till	do.
New Road, Longpobty, Bangor	Highways Com.	J. Gill	do.
Cottage, &c. Cupar Fife (N.B.)	.....	D. Storrar	do.
*Sewerage Works	Godalming U.S.A.	*Official*	do.
*Granite Tram and Edge Kerb	Ramsgate T.C.	do.	do.
Engine and Boiler House, Chimney, &c.	Eastleigh (Hants) Loc. Board	H. J. Weston	do.
Cast-iron Pipes (3,850 yards)	Hastings	P. H. Palmer	do.
Kerbing and Paving, Collingwood-road	Witham Local Board	H. Everard	Feb. 23
Road Works, Woodstock	Wootton Highway Bd.	W. C. H. Bennett	do.
*Works and Materials	Hornsey Loc. Bd.	T. De Courcy Meade	do.
Saleroom, Shops, Offices, &c. Upper Camp-field Market	Manchester Corp.	J. Allison	do.
Road Materials, &c.	Bacup Town Council..	W. Wilson	Feb. 24
Cast-iron Pipes	Dewsbury and Heckmondwike Waterwks Committee	G. H. Hill	do.
Main Sewer, Alverthorpe, Wakefield	.....	F. Massie	do.
School Buildings, Dover-street	Nelson (Lancs.) School Board	Thos. Bell	do.
Sewer, &c. Garden-street	Stafford Corp.	W. Blackshaw	Feb. 25
*Sinking Well, &c.	Rochford Union	Jas. Mansergh	Feb. 26
*Idiots' Block	Hants County Asylum	B. S. Jacobs	do.
Paving Setts (1,200 tons)	Belfast Harbour Com.	G. F. L. Giles	do.
Hospital, Brierley, near Wakefield	Hemsworth U.R.S.A.	Mr. Richardson	do.
Cemetery Chapels	Nelson Corporation ..	H. Whitaker	do.
*Two Chapels, Lodges, Gates, Wall, &c.	King's Norton U.R.S.A	F. B. Andrews	do.
*Materials, &c.	St. Mary (Newington) Vestry	*Official*	do.
*Drainage Works	Cromer Local Board ..	A. F. Scott	do.
School Buildings	Bodmin School Board	W. J. Jenkins	Feb. 27
*Making-up Roads	Tottenham Loc. Bd. ..	P. E. Murphy	do.
*Works and Materials	Willesden Loc. Bd. ..	O. Claude Robson	do.
*Road-Making and Paving Works	do.	do.	do.
Water Tank (200,000 galls.) at Asylum, Abergavenny	.....	Swash & Bain	do.
Granite (18,000 tons)	Bucks County Council	R. J. Thomas	do.

CONTRACTS—*Continued.*

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
*Goods Shed and Office, Market Drayton	G. W. R. Co.	*Official*	Feb. 27
Walling, &c. Burial Ground	St. Blazey (Cornwall) Burial Board	do.	Feb. 28
Road Metal	Beds. County Council	do.	do.
*Road Materials	Cranbrook R.S.A.	do.	do.
*Works and Materials	Hackney Bd. of Works	J. Lovegrove	do.
*Making-up and Paving Road	Fulham Vestry	J. P. Norrington	do.
Sewage Outfall, Emerald-street	Saltburn-by-Sea Local Board	G. S. Hikeley	do.
Surveyor's Stores	Middleton (Lancs.) Corp.	W. Welburn	do.
*Sewerage Works	Saltburn-by-the-Sea Local Board	G. S. Hikeley	do.
Public Hall, Shops, &c.	Ebbw Vale (Mon.) Central Pub. Hall Co.	E. A. Johnson	Mar. 1
Boundary Walls, &c. at Cemetery, Ocklynge	Eastbourne Burial Bd.	H. E. Rumble	do.
Skew Bridge over River Worth, Ingrow	Keighley Corp.	W. B. Hopkinson	do.
Steel Pipes (1,800 tons.)	Bradford Corporation	Jas. Watson	do.
*External Painting at Schools	North Surrey Dst. Sch.	A. G. Hermell	Mar. 2
Pipe Sewer (3,055 yds.)	Skipton U.R.S.A.	Barber & Co.	do.
School Enlargement, Princes-road, Buckhurst Hill (Essex)	Chigwell Sch. Bd.	E. Egan	Mar. 3
Sewerage Works, near Kettering	Rothwell Loc. Bd.	W. T. Pearson	do.
*Works and Materials	Sheffield Town Council	C. F. Wike	Mar. 5
Three Harbours, Golspie, Sutherlandshire, N.B.	.....	Jas. Barron	do.
Granite Road-Metal Retford	.....	J. D. Kennedy	do.
*Cooking and Heating Apparatus	Bishop's Stortford U.	*Official*	do.
*Schools, Upper Dovercourt	Harwich Sch. Bd.	J. W. Start	Mar. 6
*Making-up Roads	Rochester Corp.	*Official*	Mar. 7
Supply of Materials	Eccles Corp.	A. C. Turley	do.
*Swimming Bath	Brighton Town Council	F. J. C. May	Mar. 8
Infirmary Buildings, &c.	Malton Union	C. H. Channon	Mar. 9
*Town Hall and Public Offices	Llanelly Local Board	W. Griffiths	Mar. 10
Additions to Schools, Elmore Green, Bloxwich	Walsall Sch. Bd.	Bailey & M'Connal	Mar. 12
*Public Offices and Institute	Leyton Local Board	J. Johnson	Mar. 13
*Works and Materials	West Ham Council	*Official*	do.
*Works and Materials, Newcastle Sub-District	War Department	do.	Mar. 14
*Iron Footbridge	Bridgnorth Corp.	do.	Mar. 21
Church (United Presbyterian), Bathgate, N.B.	Thos. Dodds.	.....	No date
*Residences at Fleet	.....	Ludford & Tulloch	do.
Vicarage House, Stowe-by-Chartley, Staffs	.....	Geo. Wormal	do.
Paving, Flagging, Sewering, &c. Dudley Hill, Bradford	.....	Jas. Young & Co.	do
Twelve Cottages, Abertillery, near Newport (Mon.)	.. ..	Bishop & Pritchett	do.
Theatre, Wakefield	.....	Mr. Matcham	do
Seven Houses, Culcheth-lane, Newton Heath (Lancs.)	J. Bury	T. Cook	do.
House, Church-street, Rushden, Northants	W. H. Darnell	H. Adnitt	do.
*Court House, Police Buildings, &c.	County of Lincoln	J. Thropp	do.
Extensions to Business Premises, Blandford-street, Ashton-under-Lyne	.....	J. H. Burton	do.
Two Detached Residences, Ben Rhydding, Yorks		Isitt & Adkin	do.
Gas Pipes, Filey, Yorks	Henry Tobey	.....	do.
Additions to Usk Priory, Mon.	R. Rickards	Veall & Sant	do.
Boiler House, Shops, &c. Chapel-street, Burnley	E. Pegler	E. Foster	do.
School Buildings, &c. Mount Zion Chapel, Pemberton, near Wigan	J. Grimshaw	Chas. Parsons	do.
*Infirmary Buildings	Guildford Union	R. Pennington	do.
		Peak & Lunn	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.
*Inspector of Works	Plymouth Corp.	3l. per week.	Feb. 26
*Engineer and Surveyors' Assistant	Willesden Loc. Bd. ..	2l. 10s. per week.	Feb. 27
*Borough Surveyor	Chesterfield T.C.	150l.	Feb. 28

Those marked with an Asterisk (*) are advertised in this number. *Competition, p.* iv. *Contracts, pp.* iv., vi., vii., viii. *and* ix. *Public Appointments, pp.* xx. *and* xxiii.

21,799.—WINDOW-SASHES: *G. Gray and another.*—The sashes are made less in width between the pulley styles of frames, so as to allow the sashes to be moved on one side sufficiently for the sash on the other side to swing clear of the inner lining and parting bead.

23,185.—SCREW CLAMP: *F. M. Fessler and another.*—The bow or bar of the clamp is not in dovetailed parts, but in a piece made altogether, so that the loosening of the bow is avoided.

NEW APPLICATIONS FOR LETTERS PATENT.

JANUARY 29.—1,858, C. Browning, Attaching Branch Metal Pipes to Mains.—1,860, G. Kirk, Automatic Sash-fastener.—1,879, O. Schmall, Building Walls, Conduits, and other allied structures.—1,882, W. Morison, Chimney and Ventilating-shaft Tops.—1,928, W. Richards and the Ceralite Syndicate, Limited, Faced Bricks, Tiles, &c.

JANUARY 30.—1,987, The Patent Gully Company Limited, and Lorenzo Crosta Surface-water Gullies.—1,993, W. Thompson, Moulding and Drying Apparatus for the Manufacture of Bricks or like articles from Plastic Material.—2,009, F. Kingston, Flushing Closets, Urinals, Sinks, &c.—2,020, F. Caston, Sliding Door or Gates.—2,026, W. Ratcliff, Carving Machines.—2,039, W. Hall and W. Bayliss, Draught Excluders for Doors, Windows, &c.

JANUARY 31.—2,079, G. Wiese, Liquid Glue.—2,097, G. Hawes, Trusses, Trestles, Abutments, or Piers for Bridges.—2,103, E. Turner, House and other Drains.—2,146, W. Bird, Mechanism for Raising and Lowering Curtains hung in front of Doors, when the Doors are opened or closed.

FEBRUARY 1.—2,201, W. Bulmer, Machine for Pressing Bricks.—2,212, J. Houghton, Windows.

FEBRUARY 2.—2,257, J. Clark, Substitute for Veneer or Enamel.—2,297, O. Frotscher, Window-frames and Sashes.—2,301, W. Gill, Machinery or Apparatus for Moulding and Pressing Bricks, &c.—2,302, W. Gill, Cutting Tables for use with Brick-making Machines.—2,333, The Anel Company, Limited and S. Allin, Door Checks and Spring Hinges.

FEBRUARY 3.—2,369, W. Hart, Apparatus for Cutting, Pasting, Hanging, and Fastening Wall, Ceiling, and other Paper.—2,370, W. James, Mouth Blow-pipe for the use of Gas-fitters, Plumbers, &c.—2,391, P. Fyfe, Drain-testing and Fumigating Apparatus.—2,414, S. Dutton, Water-closets.

PROVISIONAL SPECIFICATIONS ACCEPTED.

24,120, F. Speed, One-piece Branch (Water-closet) Connexion Pipes.—24,915, J. Lumley and T. Linskill, Window Frames and Reversible Self-balancing or other Sliding Sashes.—27, J. Pratt, Glazing Horticultural and other Buildings.—580, H. Barham, Attaching or Securing Door and other Knobs to their Spindles.—880, C. Holmström, Preventing the Freezing of Water in Pipes and Cisterns.—898, A. Brown, New Tool or Augur Bit.—1,047, H. Birkbeck, Collapsible Doors.—1,142, F. Smith, Bakers' Ovens.—1,175, J. Cowell, Screw-drivers.—1,359, F. Strover, Louvre Chimney-top.—1,427, A. McAra, Portland Cement.

COMPLETE SPECIFICATIONS ACCEPTED.

(Open to Opposition for Two Months.)

3,106, W. Webster, Cement.—4,178, R. Taylor, Clay Dryer.—6,310, A. Bridgman and D. House, Saw Benches and other Sawing Machines.—6,661, Craven, Dunnill, & Co., Limited, and F. Smith, Tiles.—12,804, A. Wright, Laths and Sheets for forming Ceilings, Floors, Partitions, &c.—21,728, A. Bridgman and D. House, Saw Benches and Sewing Machines.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

FEBRUARY 6.—By *W. J. Newell:* 233, 235, Queen's-rd., Peckham, u.t. 71 yrs., g.r. 9*l.*, r. 72*l.*, 680*l.*—By *Smith, Son, & Cooper:* 16, Everilda-st., Islington, u.t. 46 yrs., g.r. 5*l.*, r. 35*l.*, 200*l.*; 1 to 5, Albion Buildings, Walworth, u.t. 60 yrs., g.r. 10*l.*, 390*l.*; 215, 217, 219, Fort-rd., Bermondsey, u.t. 40 yrs., g.r. 12*l.*, 750*l.*—By *P. M. Puckridge:* 40, Hethpool-st., Edgware-rd., u.t. 44 yrs., g.r. 7*l.* 7*s.*, r. 33*l.*, 245*l.*—By *C. F. Dowsett:* Three plots of f. land, Norwood, 4 a. 0 r. 4 p., 1,185*l.*; 29, Stockwell-pk.-cres., Stockwell, u.t. 33 yrs., g.r. 12*l.*, r. 50*l.*, 150*l.*—By *Debenham, Tewson, & Co.:* 72, Ludgate Hill, City, u.t. 26 yrs., g.r. 375*l.*, r. 765*l.*, 2,550*l.*; 159, Finchley-rd., Hampstead, u.t. 44 yrs., g.r. 18*l.* 19*s.* 2*d.*, 1,460*l.*; 31, Fairfax Mews, u.t. 61 yrs., no g.r., 300*l.*

FEBRUARY 7.—By *Brodie, Timbs, & Co.:* 4, Dartmouth-pk.-rd., Highgate-rd., u.t. 58 yrs., g.r. 9*l.*, r. 45*l.*, 480*l.*; 210, Kentish Town-rd., u.t. 44 yrs., g.r. 12*l.*, r. 75*l.*, 880*l.*; 16, Queen's-rd., Finsbury-pk., u.t. 65 yrs., g.r. 9*l.*, r. 45*l.*, 425*l.*; 2, Brownswood-pk., u.t. 65 yrs., g.r. 11*l.*, r. 50*l.*, 485*l.*

FEBRUARY 8.—By *Fraser & Heigh:* 4, Woodgrange-rd., Forest Gate, u.t. 82 yrs., g.r. 14*l.*, r. 100*l.*, 2,005*l.*; 60 o 66 (even), High-st., Walthamstow, f., r. 97*l.*, 1,700*l.*; 17, East Avenue, f., r. 26*l.*, 500*l.*; 87, Tredegar-rd., Bow, f., r. 43*l.*, 530*l.*—By *A. T. Macer:* 28, 30, Solon New-rd., Clapham, u.t. 85 yrs., g.r. 12*l.* 12*s.*, r. 68*l.*, 665*l.*—By *Reynolds & Eason:* 74, Charlotte-st., Fitzroy-sq., u.t. 53 yrs., g.r. 120*l.*, r. 250*l.*, 1,280*l.*; 16, London-st., u.t. 17 yrs., g.r. 65*l.*, 150*l.*—By *Newbon & Co.:* L.g.r. of 55*l.*, Canonbury Lane, u.t. 8 yrs., 245*l.*; i.g.r. of 18*l.*, Shaftesbury-st., Hoxton, u.t. 5 yrs., g.r. 7*l.* 10*s.*, 31*l.*; 36 to 44 (even), Warner-st., Barnsbury, u.t. 65 yrs., g.r. 40*l.*, r. 323*l.* 1*s.*, 1,780*l.*; 90, Roman-rd., u.t. 67 yrs., g.r. 6*l.* 10*s.*, 330*l.*; 13, 15, Barnsbury Grove, u.t. 70 yrs., g.r. 10*l.*, r. 54*l.*, 500*l.*; 99, Murray-st., Hoxton, u.t. 48 yrs., g.r. 4*l.* 4*s.*, r. 36*l.*, 325*l.*; 82, Queen's Head-st., Islington, u.t. 42 yrs., g.r. 5*l.* 5*s.*, r. 34*l.*, 305*l.*; 22, Foulden-rd., Stoke Newington, u.t. 78 yrs., g.r. 6*l.*, 375*l.*—By *Stimson & Sons:* 78, 80, 82, Brandon-st., Walworth, f., r. 160*l.*, area 7,550 ft., 2,650*l.*; 84, 86, Brandon-st., f., r. 68*l.*, 1,000*l.*; 29, 33, 35, Exmouth-st., Clerkenwell, u.t. 22 yrs., g.r. 74*l.*, r. 178, 590*l.*; 18, Beryl-rd., Hammersmith, u.t. 95 yrs., g.r. 5*l.*, 205*l.*

FEBRUARY 9.—By *Salter, Rex, & Co.:* 25, 27, Gaisford-st., Kentish Town, u.t. 54 yrs., g.r. 10*s.*, r. 100*l.*, 1,040*l.*; No. 77, 79, 83, 85, 87, Gaisford-st., u.t. 56 yrs., g.r. 1*l.* 5*s.*, r. 217*l.*, 2,310*l.*; 102, 104, 106, Gaisford-st., u.t. 56 yrs., g.r. 25*l.* 4*s.*, r. 124*l.*, 1,060*l.*; 119, 121, 123, Gaisford-st., u.t. 56 yrs., g.r. 25*l.* 4*s.*, r. 127*l.*, 1,020*l.*; 41, Caversham-rd., u.t. 56 yrs., g.r. 12*l.*, r. 60*l.*, 500*l.*; 81, Peckwater-st., u.t. 56 yrs., g.r. 6*l.* 6*s.*, r. 39*l.*, 280*l.*

[*Contractions used in these Lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; g.r. for improved ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street.; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.]

PRICES CURRENT OF MATERIALS.

TIMBER.		
Greenheart, B.G.	ton	9/0/0 0/0/0
Teak, E.I.	load	9/10/0 15/10/0
Sequoia, U.S.ft.cu		2/3 2/6
Ash, Canada load		2/10/0 3/15/0
Birch, do.		2/10/0 3 10/0
Elm, do.		3/5/0 4/10/0
Fir, Dantsic, &c.		1/5/0 2/10/0
Oak, do.		2/15/0 5/0/0
Canada		5/10/0 7/0/0
Pine, Canada red		2/15/0 3/5/0
Do. Yellow		2/5/0 4/10/0
Lath, Dantsic, fath		4/10/0 5/10/0
St. Petersburg		5/0/0 6/10/0
Wainscot, Riga, &c., log		2/5/0 4/10/0
Odessa, crown		2/5/0 4 10 0
Deals, Finland 2nd & 1st std 100		8/0/0 10/10/0
Do. 4th & 3rd		7/10/0 8/0/0
Do. Riga		7/10/0 9/0/0
St. Petersburg, 1st yellow		10/0/0 13/10/0
Do. 2nd yellow		8/0/0 9/0/0
Do. white		8/10/0 11/0 0
Swedish		8/0/0 16/0/0
White Sea		8/0/0 16 10/0
Canada, Pine 1st		22/10 0 29/10 0
Do. do. 2nd		17/0/0 18/10/0
Do. do. 3rd, &c.		7/10/0 10/10/0
Do. Spruce, 1st		9 0 0 11/0/0
Do. do. 3rd & 2nd		6/10/0 7/15/0
New Brunswick		6/0/0 7/5 0
Battens, all kinds		3/0/0 15/0/0
Flooring boards, sq., 1 in. prep. 1st		0/10/6 0/15/6
Do. 2nd		0/7/6 0/13/0
Other qualities		0 5/3 0/7 0
Cedar, Cuba	ft.	3/4 4/4
Honduras, &c.		3 4/4
Mahogany, Cuba		3/4 6
St. Domingo, cargo av.		3 1/6
Mexican do. do.		3 4
Tobasco do. do.		3/4 6
Honduras do.		3/4 5/4
Box, Turkey ton		4/0/0 13/0/0
Rose, Rio		8 0/0 18/0/0
Bahia		7/0/0 17/0/0
Satin, St. Domingo		0/0/5 0/1/0

TIMBER (*continued*).		
Satin, Porto Rico		0/0/6 0/1/6
Walnut, Italian		0/0/3½ 0/0/7

METALS.		
Iron—Pig, in Scotland	ton	2/3/7 0/0/0
Bar, Welsh, in London		5/17/6 6/0/0
Do. do. at works in Wales		5/7/6 5/10/0
Do. Staffordshire, in London		6/0/0 6/10/0
COPPER—British cake and ingot		43/0/0 43/15/0
Best selected		44/0/0 44/15/0
Sheets, strong		52/0/0 0/0/0
Chili bars		41/1/3 41/6/3
YELLOW METAL	lb	0/0/4½ 0/0/5
LEAD—Pig, Spanish	ton	9/5/0 0/0/0
English com. brands		9/7/6 0/0/0
Sheet, English, 6 lbs. per sq. ft. and upwards		11/0/0 0/0/0
Pipe		11/10/0 0/0/0
ZINC—English sheet	ton	19/10/0 0/0/0
Vieille Montagne		20/0/0 0/0/0
TIN—Straits		69/10/0 70/0/0
Australian		69/15/0 70/5/0
English Ingots		74/10/0 75/0/0
Banca		74/10/0 75/0/0
Billiton		72/10/0 73/0/0

OILS.		
Linseed	ton	20/2/6 20/7/6
Cocoanut, Cochin		32/0/0 0/0/0
Do. Ceylon		24/0/0 24/5 0
Palm, Lagos		25 0/0 0/0/0
Rapeseed, English pale		22/15/0 23/0/0
Do. brown		21/0/0 0/0/0
Cottonseed ref.		20/5/0 21/15/0
Oleine		22/0/0 24/0/0
Lubricating, U.S.		4/0/0 5/0/0
Do. refined		5/0/0 12 0 0
TAR—Stockholm	barrel	0/19/6 1/0/0
Archangel		0/12/6 0/0/0

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.*]

BALDOCK (Herts.).—Accepted for supplying and fixing 338 yards fencing at the cemetery, for the Local Board :—
Bayliss & Co., Wolverhampton £264 2 0

BIRMINGHAM.—Accepted for the erection of police-station, &c., Cradley, for the Standing Joint Committee. Mr. Henry Rowe, County Surveyor, Worcester :—
G. H. Marshall, West Smethwick, nr. Birmingham £2,500 0 0
[Twenty tenders submitted.]

BLACKBURN.—Accepted for alterations, &c., to school buildings, Four Lanes-end, for the School Board. Messrs. Simpson & Duckworth, architects, Richmond-chambers, Blackburn :—
Jas. Sharples, Blackburn £654 0 0

BLACKBURN.—Accepted for farm-house and farm buildings, Lower Royshaw, near Blackburn :—
Jas. Sharples, Blackburn £799 7 0

BRADFORD (Yorks.). — For supplying 16,512½ tons cast-iron socket pipes, principally 3 ft. 6 in. in diameter, and 872 1-3 tons specials for ditto; total, 17,384½ tons, for the Corporation. Mr. Jas. Watson, C.E., Waterworks Engineer, Town Hall, Bradford:—

Cochrane Grove & Co., Ormesby Iron Works, Middlesbro'-on-Tees	£70,584	1 8

BRADFORD (Yorks.).—For reconstruction and additions to shed—and warehouse—premises, Valley Mills, Manningham, for Messrs. Samuel Sutcliffe & Son, Limited. Messrs. Jas. Young & Co., architects, 62, Market-street, Bradford :—

James Deacon	£1,200	0 0 All trades.
Edward Whitfield	1,288	10 0 ,,
Joseph Cliff & Co.	198	15 0 Ironfounder.
Samuel Lister	200	7 10 ,,
S. Denison & Son	247	5 8 ,,
James Deacon, Shipley (accepted)	1,695	0 0 All trades (except painter), ironfounder included.

BRENTWOOD.—For spray baths and lavatories at the Hackney Union Training Schools, Brentwood, for the Guardians of the Hackney Union. Mr. W. A. Finch, architect, 76, Finsbury Pavement, London, E.C. :—

Doulton & Co.	£2,326	Coxhead	£1,257
Finch & Co.	1,416	Tabor & Hinchcliffe	1,180
Jennings	1,300	Wenham & Waters	975
Clarke & Sons	1,294		

BURNLEY.—For supplying 1,770 yards 3-in. and 4-in. cast-iron water-pipes, also laying same, for the Union Rural Sanitary Authority. Mr. S. Edmondson, Surveyor. Quantities by Surveyor :—

Excavating and Laying the Pipes.

Joseph Wadge	£137 2 3	Thos. Horrocks	£98 2 9
James Brayshaw	102 16 9½		

For Pipes.

Cochrane & Co.	£212 9 3	Staveley Iron Co.	£184 12 0
C. S. Mallett	193 3 8	Clay Cross Iron Co.	183 2 2
Watson, Gow, & Co.	191 14 6	R. Laidlaw & Son	182 7 6
Fred Silvester & Co.	190 16 8	Stanton Ironworks Co.	182 5 4
Firmstone & Bros.	190 10 4	Newton, Chambers, & Co.	181 12 0
Jas. Ritchie	190 7 4	Macfarlane, Strang, & Co.	179 10 2
Clapham Bros.	189 16 0		
Jas. Oakes & Co.	189 9 3		
E. & W. Haley	188 14 8		

BUXTON (Derbyshire).—For new residence, Palace-road, or Mr. Edward Hay. Mr. Wm. Holland, architect, 9, Bridge-street, Buxton :—

J. H. Holmes	£1,380	G. Dalton	£1,312 0
A. & E. Oakes	1,368	E. Brown	1,272 0
J. Gladwin	1,350	A. Wall	1,266 0
J. M. Brown	1,346	J. Warrall	1,216 0
G. Brocklehurst	1,341	J. Salt, Buxton *	1,200 0
Hinch & Bennett	1,316	* Accepted.	

CARRICK-ON-SUIR. — For the erection of five labourers' cottages, for the Union Guardians :—
Richd. Whittle ..... £117 | Jer. Deempsery £116

CHALTON (Beds.).—For the erection of school buildings and teacher's house, for the Toddington School Board. Mr. J. T. Lawrence, architect, Leighton Buzzard :—

James Ayres	£898	David Dunham, Toddington (accepted)	£800
Arthur Nash	818		

CHELMSFORD.—For a pair of villa residences, Chelmsford. Mr. R. Mawhood, architect :—

H. Gozzett	£862 0	J. Smith	£745 0
E. West	825 0	E. Saltmarsh	717 17
Choat & Son	802 0	W. Samms, Chelmsford (accepted)	665 0
W. Fincham	790 0		

CLACTON-ON-SEA. — For alterations and additions to the "Towers" Hotel, Marine Parade, Clacton-on-Sea, for Mr. John Fenton Jones, J.P. Mr. W. A. Finch, architect, 76, Finsbury-pavement, London, E.C. :—

Brown	£3,045	Everett & Son	£2,547
West	2,963	N. De Maid, Clacton*	2,050
Dodson	2,644	* Accepted.	

CLACTON-ON-SEA. — For alterations and additions to the "Bedford" Private Hotel, Clacton-on-Sea, for Mr. John Fenton Jones, J.P. Mr. W. A. Finch, architect, 76, Finsbury-pavement, London, E.C. :—
N. De Maid, Clacton £500 0 0
[Accepted without competition.]

CROYDON.—For additions and alterations to school buildings, Bynes-road, Brighton-road, for the School Board. Mr. Robt. Ridge, Surveyor, School Board Offices, Katherine-street, Croydon. No quantities :—

Hanscomb & Smith	£295 10	J. Smith & Son	£263 0
W. Smith	295 0	W. Akers & Co.	247 17
J. & C. Bowyer	285 0	A. Bullock, Croydon*	224 0
D. Waller	275 0	* Recommended for acceptance.	

ECCLES (Lancs.).—Accepted for paving, sewering, flagging, &c., Andover and two other streets, Patricroft, for the Highways' Committee. Mr. A. C. Turley, Borough Surveyor, Town Hall, Eccles :—

Andover-street.
Wm. Armstrong, 65, Manchester-road, Walkden £170 0 8

Hampson-street.
Wm. Armstrong, 65, Manchester-road, Walkden 250 13 4

Lincoln-street.
Wm. Armstrong, 65, Manchester-road, Walkden 275 14 8

FARNHAM.—For the erection of additional bedrooms, &c., "Railway Arms" Inn, for the Farnham United Breweries Company, Limited. Mr. S. Stapley, architect, West-street, Farnham :—

Tompsett & Kingham	£259	Curtiss	£230
Diamond	246	Kimber, Farnham*	228
Figg	235	Robins	221
German	230	* Accepted.	

FRILSHAM (Berks.).—For erecting bailiff's house and farm buildings, for Sir Cameron Gull, Bart. Mr. S. Gambier Parry, architect, Connaught Mansions, Victoria-street, S.W. Quantities by Messrs. Northcroft, Son, & Neighbour, 57, Charing Cross, S.W. :—

	Bailiff's house.	Farm buildings.	Total.
Grace, Winchester	£1,736	£3,062	£3,798
Wheeler Bros., Reading	1,600	3,000	4,600
Estcourt, Gloucester	1,671	2,744	4,415
Bottrill & Son, Reading	1,478	2,598	4,076
Stevens & Bastow, Bristol	1,498	2,497	3,995
Colls & Son, Dorking	1,250	2,744	3,994

GOOD EASTON (Essex).—For building a pair of cottages, Good Easton :—
W. Baker, Danbury £255 0 0
[No competition.]

GUILDFORD.—For laying a surface water drain and other works, Foxenden Building Estate, for the Corporation. Mr. F. T. Maltby, C.E., Borough Surveyor, High-street, Guildford :—

Contract No. 1.

Fry Bros.	£85 0	William Cunliffe, Kings-ton-on-Thames*	£66 0
G. A. Franks	71 10	* Accepted.	

Contract No. 2.

Fry Bros.	£180 0	William Cunliffe	£123 10
G. A. Franks	155 13	W. J. Engall, Guildford*	86 10
		* Accepted.	

HORSELL (Surrey).—For the erection of a bungalow in the parish of Horsell, for Mr. J. B. S. Lancaster, to be heated entirely by gas and lighted by electricity. Mr. R. Clamp, architect, Woking :—

G. Allard	£587	Harris & Son	£563
A. A. Gale	580	H. Ingram, Woking*	490
		Exclusive of stoves and decorative work.	
		* Accepted.	

INGATESTONE.—For a villa residence to be built at Ingatestone, Essex. Mr. R. Mawhood, architect, Chelmsford :—

Choat & Son	£964	S. Avey	£850
F. Johnson	898	J. Cross, Hutton (accepted)	845

KIDDERMINSTER.—For the erection of engine pump-house and tank; also laying drains, for the Health Committee. Mr. Arthur Comber, Borough Surveyor, Town Hall, Kidderminster :—

Richd. Coates	£169 0	A. H. Gittens	£106 15
T. Vale	142 0	H. Smith, Kidderminster (accepted)	105 0
Richd. Thompson	129 3		
Geo. Law	108 14		

LEAMINGTON.—For providing and laying 700 yards cast-iron pipes, and fixing valves, &c., for the Corporation. Mr. de Normanville, Corporation Engineer, Town Hall, Leamington :—

Coventry Gas Fittings Co.	£280 0	R. Bowen	£269 10
Jacob Biggs	275 0	E. Warwick	256 10
Leamington Gas Fittings Co.	270 0	John Warwick, Leamington (accepted)	245 0

LONDON.—For the erection of a refreshment-house at Parliament Hill, for the London County Council :—

M. Patrick & Son	£1,553 0 0	H. Wall & Co.	1,197 9 0
William Smith	1,400 0 0	John H. Newman	£1,195 0 0
Charles Godbold	1,380 7 3	Stimson & Co.	1,180 0 0
F. Gough & Co.	1,258 0 0	S. Hipwell	1,158 10 4
W. Gibbin & Son	1,238 16 6	W. T. Ballard	1,087 1 8
Howard & Co.	1,232 0 0	John W. Mellor	1,078 0 0
Henry Eady	1,222 8 9	A. Wallis*	1,059 1 11
		* Accepted.	

LONDON.—For the execution of drainage works, and construction of tank and filter beds, East Finchley, for the Islington Burial Board. Mr. F. H. Barfield, Surveyor, Burial Board Office, Vestry Hall, Islington, London, N. :—

Marchant & Hirst	£439	J. S. Davis	£297
Chas. Plowman	330	A. T. Catley	294
Eastell & Son	316	C. W. Killingback & Co., Camden Town (accepted)	279
Thomas Adams	315		

LONDON.—For works connected with the "Cubicals" at Billiter Buildings, for the International Trustee, Assets, and Debenture Corporation, Limited. Mr. Frederick H. Holdsworth, architect and surveyor, 91, Billiter Buildings, Billiter-street, E.C. :—

J. Carter & Co.	£498 10	J. H. Greenwood	£303 0
A. Morgan	445 0	C. L. Cole	299 0
J. H. Newman	341 0	Maxwell Bros. (accepted)	289 0

LONDON.—For the erection of new workshop building in connexion with the Woolwich Polytechnic. Mr. H. H. Church, architect, William-street, Woolwich. Quantities by Mr. W. Whincop, 44, Norcott-road, Stoke Newington, N. :—

Balaam Bros.	£4,194	J. Chapman	£3,987
H. Brown	4,159	H. L. Holloway	3,918
Chessum & Sons	4,090	Young & Lonsdale	3,887

LONDON.—For the construction of river wall and of foundations for mill and granary, at Chelsea Wharf, Lots-road, S.W., for the London General Omnibus Company, Limited. Mr. Percy W. Britton, Superintendent, Engineering and Building Department :—

Perry & Co.	£7,110 0 0	Docwra & Son	£5,304 0 0
Mowlem & Co.	5,616 0 0	S. Chafen	4,294 12 4
G. Parker	5,600 0 0	Colwell & Hazle*	4,179 2 0
		* Accepted with agreed alteration at £4,050.	
		[Estimate, £4,200.]	

LONDON.—For the structural steel work and fireproof flooring and concrete paving, at additional stables at Holloway and Cricklewood, for the London General Omnibus Company, Limited. Mr. Percy W. Britton, C.E., Superintendent, Engineering and Building Department :—

Holloway. Cricklewood.

Patent Paving and Construction Company, Limited, and Matthew T. Shaw & Co. (inclusive)* ..... £752 4 4 .. £669 19 5
* Accepted.

LONDON.—For rebuilding the "Bricklayers' Arms," Battersea-square, S.W., for Messrs. Truman, Hanbury, Buxton, & Co. :—
Sheffield Bros., Stoke Newington £865

LONDON.—For pulling down and rebuilding the "Spread Eagle" public-house, High-street, Homerton, E., for Messrs. Combe & Co., Limited. Mr. W. A. Finch, architect, 76, Finsbury-pavement, E.C. :—
Messrs. Bush & Sons, 6A, Ridgmount-street, W.C. (accepted without competition) £4,000

LONDON.—For gas-fitters' work at the "King's Arms," Bishopsgate-street, Without :—

Winn (accepted)	£241 5 6	Vaughan & Brown	£161 0 0
Biggs	183 14 0	Stedman	151 18 6
Dix	161 1 6	Christie	129 16 0

LONDON.—For new drainage and sanitary fittings at 8 and 8A, Whitehall-place, S.W., for Messrs. Jennings White, Mills, & Co. Messrs. Robins, Snell, & Gore, surveyors, 22, Conduit-street, Bond-street, W. :—
J. Kent £219 17 0

LONDON.—For repairs, decorations, and new drainage at 105, Regent-street, W., for Mr. T. E. Hall. Messrs. Robins, Snell, & Gore, surveyors, 22, Conduit-street, Bond-street, W. :—
Dixon & Jones £288 10 0

LONDON.—For alterations at 146, and 148, Euston-road, for the County of London House Property Association, Limited. Messrs. Robins, Snell, & Gore, surveyors, 22, Conduit-street, Bond-street, W. :—

Dixon & Jones	£168 0 0
Patman & Fotheringham	110 0 0
R. & J. Sheirs (accepted)	107 0 0

LONDON.—For alterations and repairs at 20, Mortimer-street, W., for Mr. H. H. Cameron. Messrs. Robins, Snell, & Gore, surveyors, 22, Conduit-street, Bond-street, W. :—

G. H. & A. Bywaters & Sons	£1 068 0 0
R. & J. Shiers	1,057 0 0
D. Gordon Laing & Son (accepted, subject to alterations)	876 0 0

LONDON. — For new drainage and sanitary fittings at 5, Whitehall-gardens, S.W., for Mrs. Palmer. Messrs. Robins, Snell, & Gore, surveyors, 22, Conduit-street, Bond-street, W. :—

R. & J. Shiers	£658	Hutchins Bros.*	£316
Patman & Fotheringham	448	* Accepted.	

LONDON.—For drainage and sanitary fittings at 5, Park-square, N.W., for Sir James Paget, Bart. Messrs. Robins, Snell, & Gore, surveyors, 22, Conduit-street, Bond-street, W. :—
Patman & Fotheringham £190 0

LONDON.—For reinstatement from fire of No. 80, Wood-street, E.C., for the executors of the late Messrs. Bennoch. Mr. Herbert Knight, architect, 75, Aldermanbury, E.C. :—
Kirby & Chase £1,552 0 0

LONDON.—For building two printing warehouses, 35 and 36, Shoe-lane, and 13, Farringdon-avenue, for Mr. H. M. Knight. Mr. Herbert Knight, architect, 75, Aldermanbury, E.C. :—
Kirby & Chase £7,200 0 0

LONDON.—For decorations, &c., 93, Brondesbury Villas, for Messrs. Farlow & Fuller. Mr. Herbert Knight, architect, 75, Aldermanbury, E.C. :—
F. Prater £129 15 0

LONDON.—For ten houses, Gipsy Hill, for Mr. H. E. Knight, Mr. Herbert Knight, architect, 75, Aldermanbury, E.C. :—
F. Sutton £4,250 0 0

LONDON.—Accepted for external alterations and other works at the "Primsoll Hotel," St. Thomas-road, Finsbury Park, for Mr. Thomas Mearsham :—
Green & Smith, South Tottenham £253 10 0

MARLBOROUGH.—For providing and laying cast-iron water mains, pipes, valves, &c. (Contract B), for the Town Council. Messrs. Fairbank & Son, engineers, Driffield :—

Biggs, Wall, & Co.	£2,717 0 0	W. Jenkins & Son	£2,257 0 0
Easton & Anderson, Limited	2,485 0 0	M. S. Kitteringham	2,227 0 0
L. H. Green	2,361 17 0	D. H. Porter & Co.	2,180 0 0
W. E. Piper	2,356 13 0	Thomas Bell, Market Weighton*	1,999 16 2
A. Wills & Sons	2,300 0 0	Peattie & Axtell	1,970 0 0
Clay Cross Co.	2,275 0 0	* Accepted.	

NEATH.—For alterations, &c., to school buildings, Glyncorrwg, Cymmer, for the School Board. Mr. T. C. Wakeling, architect, Merthyr and Neath. Quantities by architect :—

F. Lewis	£299 15	D. Lloyd, Cymmer,	
Hy. David & Son	330 0	R.S.O. (accepted)	£295 0

PARKSTONE (Dorset).—For the formation, metalling, and draining roads, &c., for the Burial Board. Mr. H. F. J. Barnes, architect, Poole :—

T. C. Rigler	£139	W. Guy	£96
G. T. Budden	117	Privett & Painter, Parkstone*	91
		* Accepted.	

READING.—For premises for Mr. G. W. Palmer, M.P., Broad-street, Reading. Mr. W. Galt Millar, architect, High-street, Reading. Quantities by Messrs. Henry Cooper & Sons, Friar street, Reading :—

T. Blake	£5,747	N. Goodchild	£5,095
Margetts	5,488	T. Pilgrim	5,049
G. Simmonds	5,450	D. Taylor	4,995
G. Wernham	5,449	A. Simmonds	4,885
Higgs & Sons	5,389	Poffley	4,860
T. Whiting	5,300	Collier & Catley	4,845
G. Searle	5,258	Bottrill & Son	4,760

SEDGHILL (Northumberland).—For the erection of a building for the Co-operative Society :—

E. & L. George	£527 0 0	D. N. Spene	£420
James Hynes	502 0 0	Jos. Oliver & Sons Killingworth*	373 0 0
John Taylor	502 6 11		
H Brown & Co.	446 8 0	Accepted.	

SALFORD.—Accepted for the erection of higher grade schools, Victor-street, for the School Board. Messrs. Woodhouse & Willoughby, architects, 100, King-street, Manchester. Quantities by architects :—

Excavating, Draining, and Brickwork.—Charles Normanton, Portsmouth-street, Chorlton-on-Medlock	£4,250 0 0*
Concreting and Asphalting.—T. E. & W. H. Davies, 50 and 52, Granby-row, Manchester	476 1 3
Masonry.—J. Stopford, Stockport-road, Manchester	960 0 0
Carpentry and Joinery.—Halstead Brothers, Eastwood, Todmorden	2,600 0 0
Smith and Founder's Work.—Edward Wood, Ocean Ironworks, Salford	447 0 0
Plumbing, Glazing, and Gasfitting.—W. H. Ashcroft, Wood-street Lead Works, Deansgate, Manchester	712 0 0
Sir John J. Harwood, Bury New-road, Manchester	598 0 0†
Slating.—William B. Moore, 51, Corporation-street, Manchester	52 5 0

* Including £850 for cane-coloured bricks for facing interior of schoolrooms, &c., instead of plaster.
† Plastering and painting, £450; Decorating and painting, £148.

SOUTHAMPTON.—For the construction of a landing stage at rear of hospital, West Quay, for the Corporation. Mr. W. B. G. Bennett, Borough Surveyor, Municipal Offices, Southampton :—

H. G. Wilson	£240	Roe & Grace, Southampton*	£110
H. W. Bull	144	* Accepted.	

[Borough Surveyor's estimate, £150.]

STAFFORD.—For additions to the public baths, or the Corporation. Mr. W. Blackshaw, Borough Surveyor, Borough Hall, Stafford :—

M. Espley	£1,389	Chatfield & Wrench, Stafford*	£1,200
M. Whittome	1,285	* Accepted.	
Adams & Pemberton	1,260		

ST. ALBANS (Herts.).—For the erection of a residence, for Mr. Dunning. Mr. F. W. Kinnier Tarte, architect :—

J. T. Bushell	£895	J. & W. Savage	£874
Boff Bros.	877	Wibley & Jervis	775

SUTTON (Surrey).—For levelling, kerbing, and making-up Belmont and other roads, for the Local Board. Mr. A. D. Greatorex, C.E., Local Board Offices, Sutton :—

	Belmont-road.	Beulah-road.	Brandon-road.	Burgess-road.
T. Adams	£254 0 0	£390 0 0	£114 0 0	£193 0 0
J. Alldred	334 0 0	357 10 0	135 0 0	260 0 0
R. Ballard	256 0 2	282 8 0	107 3 5	190 11 11
Broderick	314 5 2	330 0 0	155 0 0	270 0 0
G. F. Fry	282 8 9	312 5 6	121 7 2	221 10 8
Free & Son	258 11 5	292 7 2	209 6 11	195 15 8
Iles	284 0 0	334 0 0	138 0 0	216 0 0
W. Jenner	278 11 10	304 2 10	116 17 7½	206 13 11
Mowlem	277 18 1	317 12 4	122 17 4	216 11 4
Mayo & Co.	305 2 8	328 12 4	158 13 0	255 9 9
E. Parry	252 0 0	355 0 0	148 0 0	248 0 0
Woodham	301 0 0	332 10 0	130 0 0	220 15 6
Wimpey & Co.	299 5 0	308 8 0	112 19 0	199 13 0
W H Wheeler	262 12 1	274 3 8	102 1 0	177 6 1
Surveyor's Estimate	280 0 0	330 0 0	100 0 0	200 0 0

	Lower-road.	Morland-road.	Queen's road.	Lea-place.
T. Adams	£160 0 0	£288 0 0	£213 0 0	£76 0 0
J. Alldred	220 10 0	333 10 0	255 0 0	94 0 0
R. Ballard	176 2 10	250 2 0	206 12 10	73 7 5
Broderick	230 0 0	316 9 8	250 0 0	90 0 0
G. F. Fry	182 7 4	282 9 8	219 1 2	78 6 4
Free & Son	170 18 3	261 16 3	207 6 8	79 3 10
Iles	200 0 0	283 0 0	235 0 0	87 0 0
W. Jenner	183 8 11	264 16 0	209 16 1	69 14 10
Mowlem	188 2 0	277 6 4	219 5 8	80 11 4
Mayo & Co.	210 16 4	307 14 6	221 14 10	93 6 3
E. Parry	221 0 0	275 0 0	239 0 0	88 0 0
Woodham	191 2 0	301 0 0	240 0 0	96 17 0
Wimpey & Co.	196 10 0	302 3 0	223 13 0	75 13 0
W H Wheeler	163 4 2	257 3 0	185 1 4	69 2 9
Surveyor's estimate	180 0 0	280 0 0	200 0 0	70 0 0

WAINFLEET ALL SAINTS (Lincs.).—For the erection of billiard-room, two shops, &c., "Woolpack" Hotel, for Mr. W. H. Gunson, The Vinery, Wainfleet. Mr. Butcher, architect, Spilsby. Quantities by architect :—

Elmes	£377 19 11	Crawshaw, Skegness (accepted)	£328 0 0
J. Turner	358 17 6		

[Amounts include using the old materials for inside work.]

WELLINGBOROUGH.—For the erection of a pair of cottages, Titley Bawk Estate, Earl's Barton, for the Phœnix Land Society, Limited. Mr. Edwd. Sharman, architect, Croyland Abbey, Wellingborough :—

W. D. Sturgess	£599 0 2	W. Stevens	£463 10 0
G. W. Souster	517 16 6	Hacksley Bros.	433 13 0
W. Berrill	474 0 0	F. Johnson & Son, Earl's Barton*	416 0 0
T. & C. Berrill	469 0 0		

* Accepted.

WESTON-SUPER-MARE.—For additions to baths, Knightstone. Messrs. Price & Wooler, architects, Waterloo-street, Weston-super-Mare :—

Chas. Taylor	£557	Chas. Addicott	£530
W. M. Dubin	535		

WITHINGTON (Lancs.).—For paving, draining, flagging, &c., No. 4 Passage and five other streets, for the Local Board. Mr. A. H. Mountain, C.E., Surveyor, Town Hall, Withington :—

	No. 4. Passage, Wellington-road, Flagging and channelling.	Mauldeth-road, West—Flagging and tar macadamizing.	Cresswell Grove, Albert Park—Sewering and draining.	Talford Grove, Albert Park—Sewering and draining.
	£	£	£	£
M. Naylor & Sons	39 15 6	548 7 7	179 4 1	70 16 6
Geo. Clarke	38 15 6	523 10 6	265 15 6	91 5 0
Worthington & Pownall, Manchester*	36 6 2	489 4 9	161 13 9	69 1 2
Jas. Farrell	42 1 6	667 15 0	187 7 6	87 12 0

* Accepted.

Tenders for engine shed.

Hill & Hayes	£67 18 6
J. & J. Parish, Withington*	72 17 0
Amos Mason	84 0 0
Evan, Roberts, & Son	92 0 0

* Accepted.

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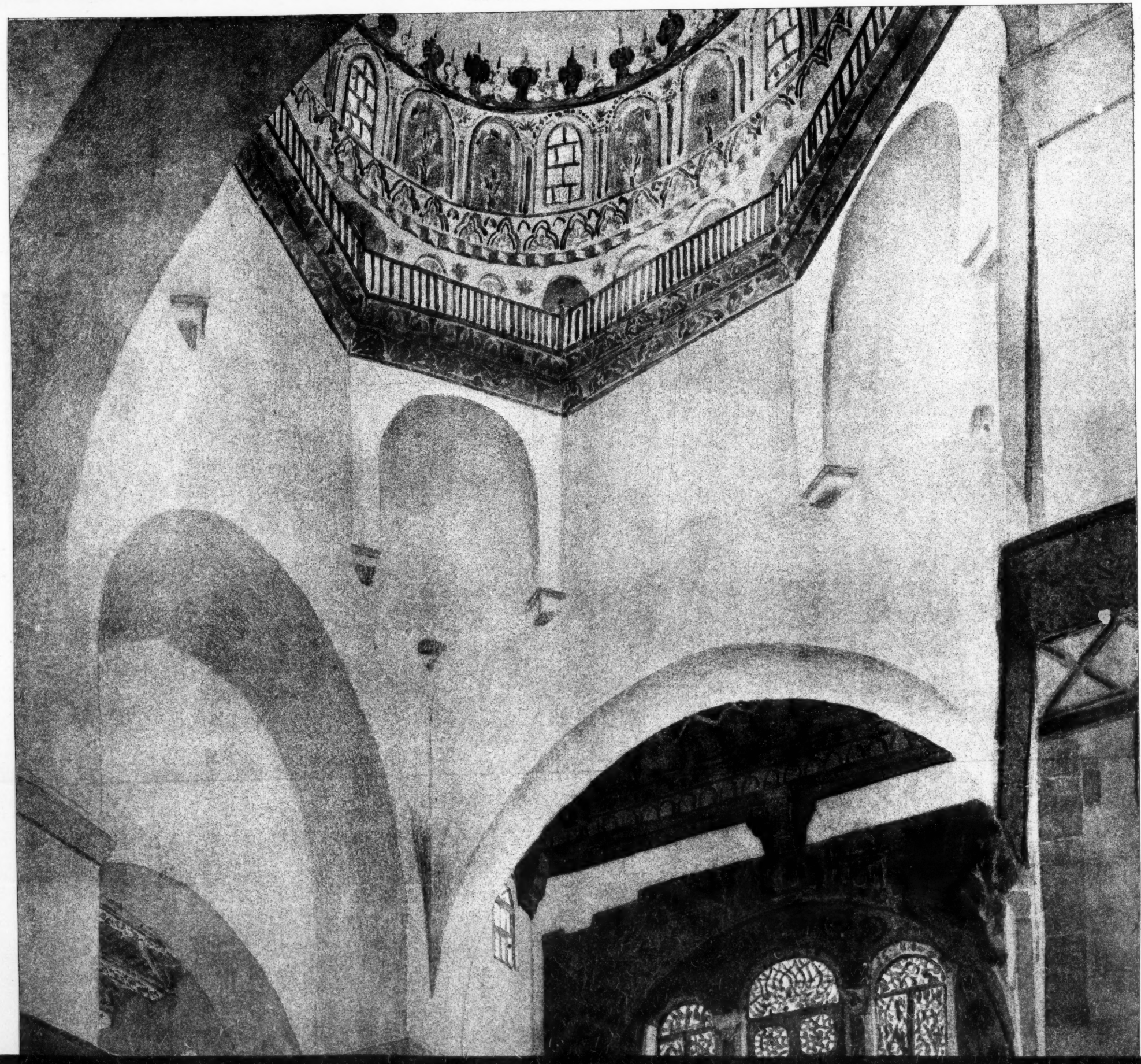

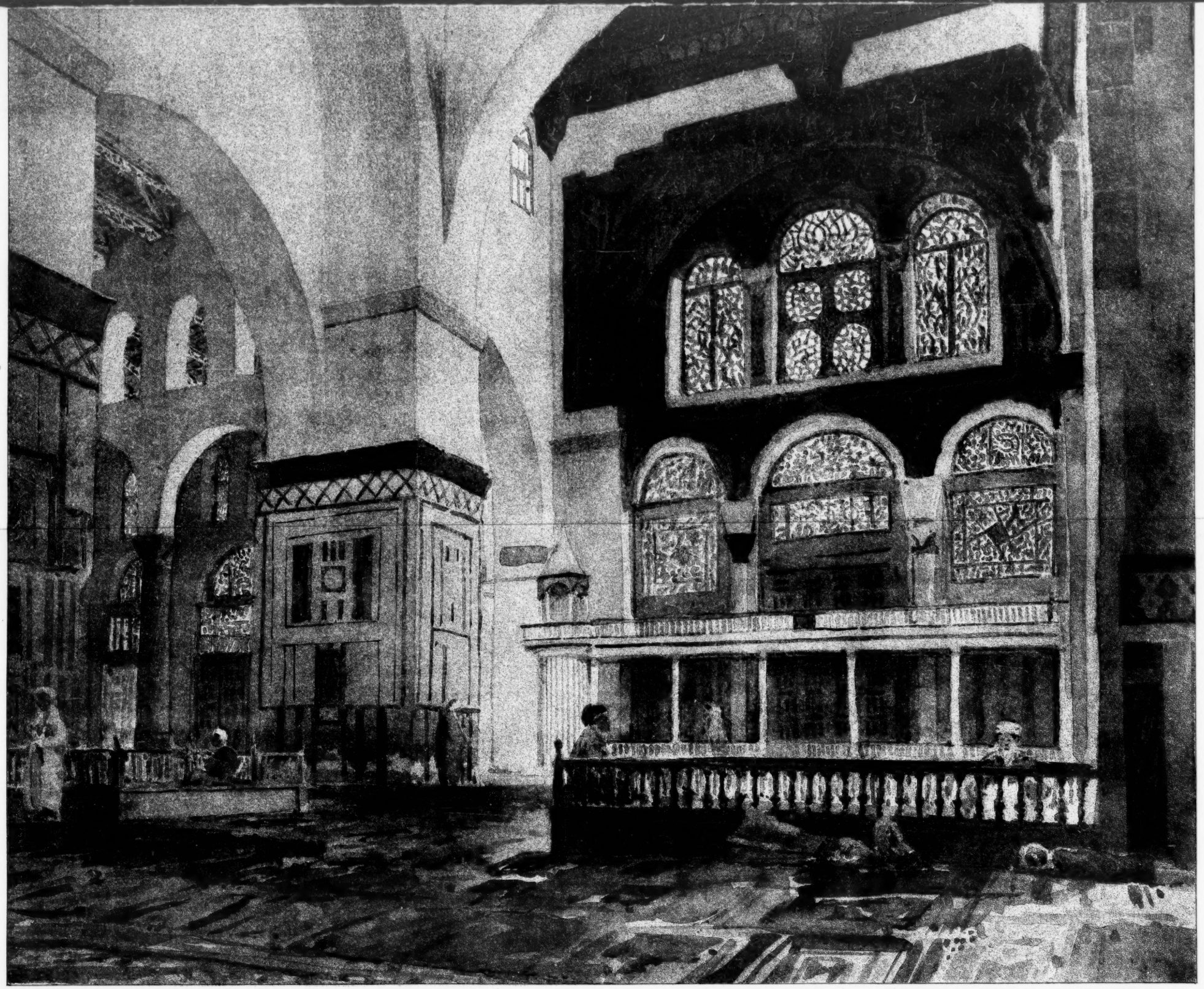

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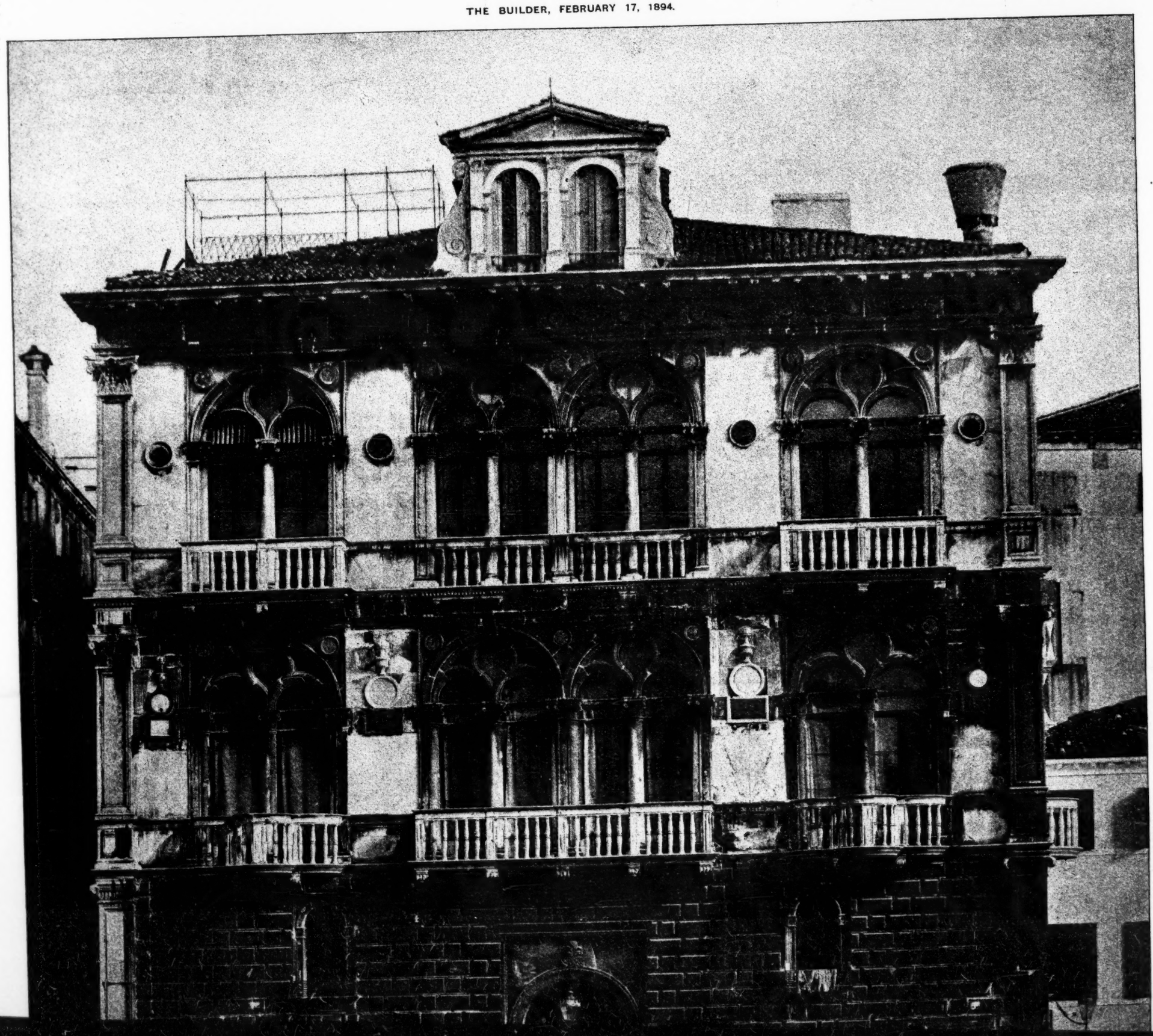
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